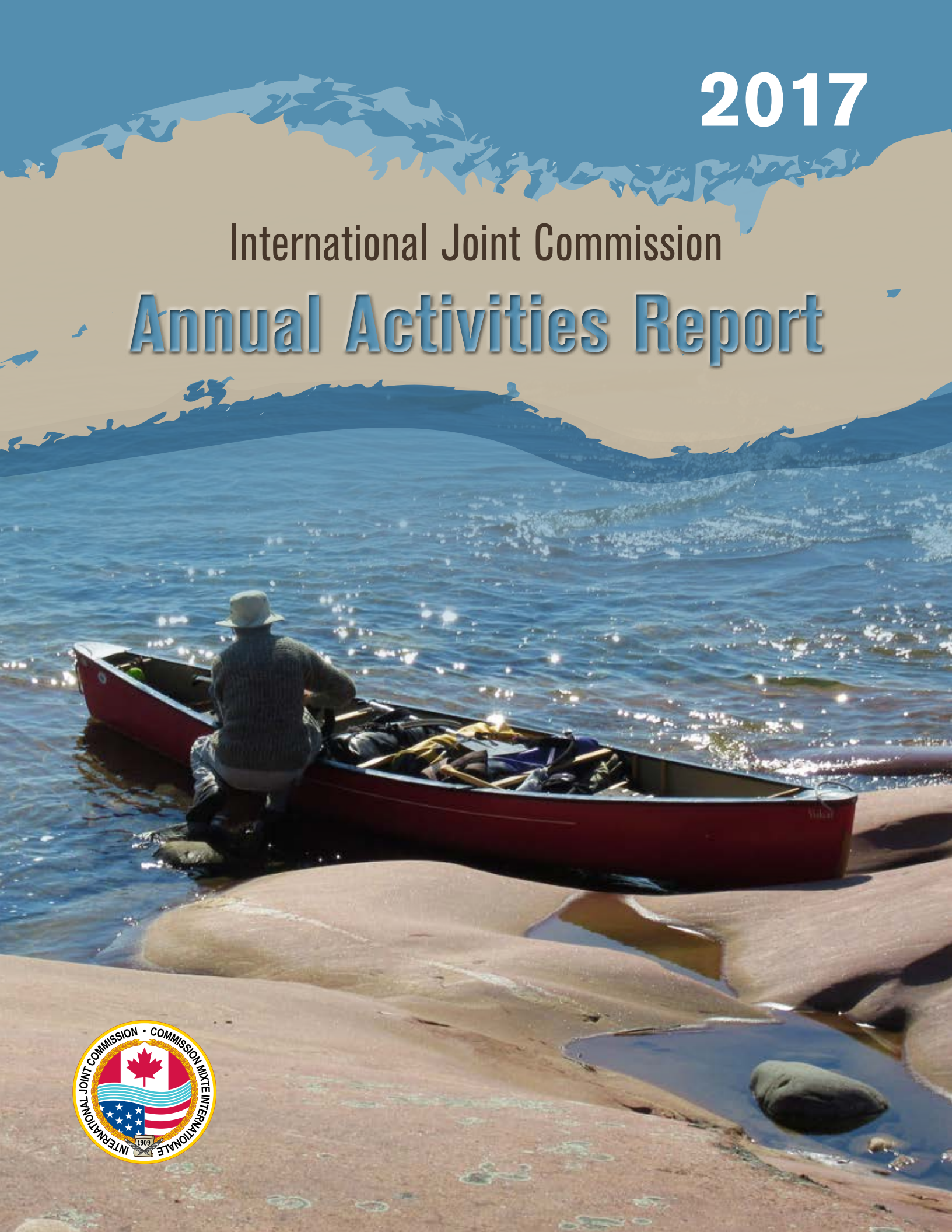
2017

International Joint Commission

Annual Activities Report



International Joint Commission

Canada and United States

About Us

Canada and the United States created the International Joint Commission (IJC) as they recognized that each country is affected by the other's actions in lake and river systems along the border. The IJC helps the two countries manage these waters wisely and protect them for the benefit of today's citizens and future generations.

The IJC is guided by the Boundary Waters Treaty, signed by Canada and the United States in 1909. The treaty provides general principles for preventing and resolving disputes over waters shared between the two countries and for settling other transboundary issues. The specific application of these principles is decided on a case-by-case basis.

The IJC has two main responsibilities: regulating projects that affect water levels and flows across the boundary, and investigating transboundary issues and recommending solutions. The IJC's recommendations and decisions take into account the needs of a wide range of water uses, including sanitation and drinking water, commercial shipping, hydroelectric power generation, agriculture, industry, fish and wildlife, recreational boating and shoreline property.

The IJC is funded by the governments of Canada and the United States.

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International Joint Commission

2017 Annual Activities Report

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2017 in Review

Since the Boundary Waters Treaty was signed in 1909, the United States and Canada have shown what two countries can accomplish when they work cooperatively. The six-member International Joint Commission (Commission) was formed out of that treaty to advise the governments on transboundary water issues where requested coast-to-coast, offering scientifically sound recommendations on water flows and water quality, all the while balancing the needs of water users. The Commission is assisted in this effort by boards and staff members from both countries with expertise in engineering, ecological sciences, law, policy, management, communications, local knowledge and traditional ecological knowledge.

From start to finish, 2017 was a busy year for the Commission across the transboundary region. In the Great Lakes basin, the Commission developed its *First Triennial Assessment Report* under the *2012 Great Lakes Water Quality Agreement*, putting out a draft for public comment in January followed by the final report in November. The report looks at all that Canada and the United States have accomplished in reaching the goals of that agreement through 2016, recognizing successes and providing recommendations on where the two nations could do more. The report covers all of the agreement's objectives, from nutrients entering the lakes and chemical pollutants to invasive species and wetland health, among other topics. The report's release follows several public meetings within the Great Lakes basin, collecting public comments online, and research and discussions between Commission staff, its Great Lakes advisory boards, and Commissioners.

Unfortunately, the Great Lakes experienced extreme weather in 2017. A confluence of unprecedented springtime rains, warm winter temperatures preventing formation of a safe ice cover on the St. Lawrence River, and significant snowmelt in the Ottawa River all came together to cause record-setting flooding along Lake Ontario and the St. Lawrence River. The Commission's International Lake Ontario-St. Lawrence River Board faced many difficult decisions in trying to limit the flooding of coastal communities along the shores of the lake and the river, while balancing the need to ensure the St. Lawrence Seaway was passable for shipping. Following the flooding, the board has started looking at what could be learned to see if there is anything it should do differently in the future.

The Commission implemented its Lake Ontario-St. Lawrence River Plan 2014 starting in January 2017, following approval by governments at the end of 2016. The plan provides guidelines to manage Lake Ontario's outflows into the St. Lawrence River, providing more natural variations in water levels to restore ecosystem health. While its implementation unfortunately coincided with the severe weather events leading to flooding on Lake Ontario and the St. Lawrence River, the plan balanced water supplies upstream and downstream of the Moses-Saunders Dam and reduced flood damages.

In the west, a wet winter and spring led to flooding in the Osoyoos Lake region, though drier conditions in the summer allowed water levels to return to normal. A wet winter followed by dry summer months saw drought conditions around the St. Mary and Milk Rivers, complicating water apportionment between the United States and Canada.

The Commission prepared new rule curves for managing emergency water levels in the Rainy Lake-Namakan Lake basin. These rule curves set out the ranges that dam operators try to keep water levels within throughout the year. A binational study board examined several years of studies conducted to prepare for the review of the rule curves, which were last set in 2000, and was assisted by an active public advisory group. The study board made recommendations to the Commission for changes to the rule curves, after hearing from residents, Tribes, First Nations and Métis, area businesses – particularly those whose livelihood is dependent on the waters – and reviewing ecosystem impacts and scientific studies. Following consultations with the two governments, the Commission plans on implementing the new rule curves in 2018. The new rule curves will allow water managers to adjust levels based on flood or drought risks in the forecasts in any given year.

At the request of governments, the Commission initiated three new studies in 2017. In the Souris River basin, a study board is investigating flooding and water supply issues with a target of providing recommendations to the Commission by 2021.

For Lake Champlain and the Richelieu River, a study board finalized its work plan, and started its work to provide recommendations to the Commission into the causes, impacts, risks and solutions to flooding in the basin. The study board is targeting a 2020 end-date for those recommendations.

Governments also gave the Commission a reference in 2017 to review nutrient loading and algal bloom issues in both the Lake Champlain and Lake Memphremagog basins. The governments asked the Commission to deliver recommendations in 2019 on how to strengthen existing efforts and accelerate progress towards the improvement of water quality. The Commission's work and successes in 2017 would not have been possible without the ongoing cooperation, collaboration and enduring friendship between Canada and the United States. With people working closely together across the international boundary, the Commission can continue to support research, report on the status and trends of water quality and water quantity, and help find solutions to problems facing both nations.

The American Falls in the Niagara Falls system. Credit: denisbin

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Chapter I: Coast-to-Coast

Osoyoos Lake-Columbia River Basin

Osoyoos Lake suffered some flooding after a wet spring and rapid snowpack melt in 2017 inundated the watershed, damaging waterfront communities. A relatively light snowpack early in the year led the International Osoyoos Lake Board of Control at its early March meeting to expect a fairly standard spring season, but precipitation into April and May in the mountains and in warmer areas brought an unforeseen amount of water into the basin, causing floods to begin in May as the snow melted.

The location of Osoyoos Lake within the Columbia River basin. Credit: Commission

Water managers fully opened the Zosel Dam downstream of the lake in an attempt to get the water levels down within the levels prescribed by the Commission's Order of Approval for the operation of the dam. A subsequent dry period in the summer months helped bring water levels down, compliant with the rule curves.

St. Mary and Milk River Basins

The St. Mary and Milk Rivers wind through the Canadian provinces of Alberta and Saskatchewan and the US state of Montana; the two rivers are linked by a manmade canal. Under Article VI of the Boundary Waters Treaty, waters are to be apportioned equally between and to the mutual benefit of both countries.

A map of the St. Mary River and Milk River watersheds. Credit: Commission

A wet winter followed by a severe dry spell in the summer months made it difficult for water managers, called Accredited Officers, to apportion the waters in the usual way. Typically they can offset extra water usage by the United States early in the year with extra water usage by Canada later in the year. The snowmelt and wet spring meant that there was no offsetting by the United States early on, but the dry weather meant Canada still needed the additional water in the summertime. Ultimately, the officers and elected officials were forced to limit irrigation late in the year and were able to shift water over from other sources.

Red and Souris Rivers

The Souris River originates in Saskatchewan before winding its way through North Dakota and Manitoba to join the Assiniboine River. The Red River basin flows northward between North Dakota and Minnesota, continuing into Manitoba and Lake Winnipeg.

Following receipt of a reference from the governments in July, the Commission established the International Souris River Study Board to investigate flooding and water supply issues in the basin, as part of the Commission's 2013 plan of study for the Souris River area. The study will examine the hydrology of the

The Souris River flows through Saskatchewan and North Dakota before entering Manitoba, while the Red River straddles the border of Minnesota and North Dakota before entering Manitoba. Credit: Commission

The sun rises over the Souris River as a researcher removes ducks from banding nets. Credit: US Fish and Wildlife Service

basin through data collection, studies evaluating the physical processes that may have contributed to recent flooding events, and the development of hydrological modeling tools. Once that work is completed, the board will make recommendations to reduce the risks of flooding and water supply issues, with a final report due in 2020. The study will also assist in continued collaboration between state, provincial, federal and municipal agencies, Tribes, First Nations, Métis, and the general public.

The International Red River Board completed its report *Twenty Years Later: Flood Mitigation in the Red River Basin*, which is to be released in 2018. The board found that the basin has become more flood resilient following improved flood mitigation measures and a higher level of preparedness compared to when the Commission issued its 2000 report *Living with the Red*. The report notes that there is still work to be done to improve the basin's flood readiness, such as improving flood forecasting methodology, developing indicators of basin resiliency, and flood-related matters on the Roseau and Pembina rivers, which connect to the Red.

Rainy Lake-Namakan Lake Basin

The Rainy-Namakan basin lies in Ontario and northern Minnesota. The basin responds quickly to changes in water supply conditions, such as extreme rainfall events, and can often go above and below the prescribed levels in the rule curves laid out by the Commission.

The Commission tasked the International Rainy and Namakan Lakes Rule Curves Study Board with evaluating the performance of the rule curves set in 2000, and examining options for improved regulation of the emergency water levels of Rainy Lake and the Namakan Chain of Lakes. The Commission's role in establishing emergency water levels stems from the 1938 Rainy Lake Convention.

Autumn sets in along the Rainy River as it flows through Franz Jevne State Park in Minnesota, with Ontario across the water. Credit: Tony Webster

Throughout the study, the board engaged with local individuals, groups, and communities. This engagement included the 32-local member Rule Curves Public Advisory Group appointed by the Commission to reflect the diverse interests in the watershed, and the Resource Advisory Group consisting of resource scientists from state, provincial and federal agencies, as well as Grand Council Treaty #3 representatives and several First Nation communities and the Métis Nation of Ontario. Based on feedback from these groups, and at more than 45 public and advisory group meetings and seminars, the study board issued its final recommendations for changes to the 2000 rule curves.

The study board found that the 2000 Rule Curves generally performed as expected, bringing benefits to the navigation, tourism, and ecology of the Namakan Chain of Lakes along with some benefit to fisheries on Rainy Lake, but that the rule curves also decrease hydropower generation and result in higher water levels in flood years on Rainy Lake. The board concluded that the 2000 Rule Curves are a viable option going forward, but that some modifications could provide additional benefits overall.

The new rule curves give water managers more leeway to deal with water supplies when drought or flood seasons are being forecasted. Commissioners held public hearings in August 2017 in the Rainy-Namakan basin, and based on the recommendations of the study board, accepted a modified version of those recommendations during the October semiannual meeting. The Commission plans on implementing the new rule curves in 2018.

Lake Champlain and the Richelieu River

Following receipt of references from governments in 2016, the IJC appointed its International Lake Champlain-Richelieu River Study Board in February 2017 to look at flooding in the basin. The board is tasked with looking at past floods, notably the 2011 flood, to evaluate adaptation strategies, develop a real-time flood forecasting system and a water resource response model to address different climactic and weather events, survey area residents and organizations about structural ways to deal with flooding, and assess all potential flood management and mitigation measures, to ultimately make recommendations in 2021.

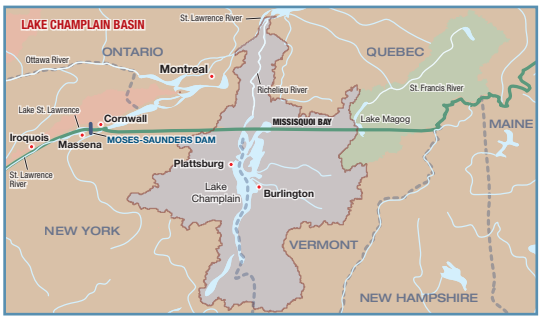
Foliage lines the Richelieu River at Saint-Jean-sur-Richelieu in Quebec. Credit: Márcio Cabral de Moura

The board held public meetings in Quebec, New York and Vermont in July to get input on what the work plan should include. The board finalized its work plan October 2.

Lake Memphremagog and Lake Champlain

In October, the Commission received a request from the governments of Canada and the United States to examine nutrient loading and harmful algal bloom issues in Lake Champlain and Lake Memphremagog, and make recommendations on how current efforts can be strengthened and improved.

Final reports for the two transboundary watersheds are due in 2019.



The Lake Champlain basin, with the Lake Memphremagog basin to its east. Credit: Commission

Chapter II: International Watersheds Initiative

Introduction

The International Watersheds Initiative (IWI) is a Commission program whereby the Commission's existing responsibilities are carried out within an ecosystem context. It recognizes that ecosystems function as interconnected systems and should be managed as such. It is also grounded in the belief that local communities, given appropriate assistance, are best placed to address issues in a basin and achieve results.

The history of IWI dates back to 1998, when the governments of Canada and the United States partially endorsed the Commission's proposal to establish international watershed boards that would adopt an integrated, ecosystem approach to transboundary environmental issues. The governments authorized the establishment of one pilot watershed board at that time.

In the years since its inception, the governments have authorized a second watershed board, and the IWI has helped to inform, engage, and provide tools for decision-makers on Commission boards at all levels to better address a broad range of water-related issues along the border. Many of the Commission's boards participate in the IWI program by submitting proposals for board projects because of concerns about water quantity and quality, and the value of using an ecosystem approach to address these concerns.

IWI Project Highlights

The International Osoyoos Lake Board of Control, along with the Washington State Department of Ecology and Okanagan Basin Water Board, collaborated to create a documentary, entitled *A River Film*, about the lake, its hydrology, and the international cooperation around it. The documentary is designed to educate the public about water management issues and practices in the watershed and to create awareness of the successful collaboration between Canada, the United States, Native Americans and First Nations. The documentary was first screened at the Osoyoos board's annual meeting in October.

In the St. Croix River basin, an IWI-funded alewife count has been held each year since 2011 to see how many of the embattled keystone species are returning each year. While that number has fluctuated year to year, 2017's strong alewife run suggests a long-term positive trend is forming. As of late July, a total of 157,750 alewives crossed the Milltown Dam located near the river mouth. This was a massive increase over the previous two years – only 33,106 alewives crossed the dam in 2016 and 93,503 in 2015, but nevertheless well below historic levels, which were in the millions. And for the first time, 56 American shad were counted crossing the dam, another keystone species that the International St. Croix River Watershed Board wants to see back in the river.

St. Croix International Water Commission Program Coordinator Bradley Stuart counts fish passing through the Milltown Dam. Credit: Heather Almeda

Alewives take about four years to reach maturity, at which point they return to rivers to spawn year after year. Since the fishway at the Grand Falls Dam that kept alewives out of the river reopened in 2013, more of these fish should be returning annually to spawn at the place where they hatched, on top of those already coming into the river. In addition to being a preyfish for birds, turtles, otters, salmon and cod in the area, alewives are a vital cultural link and food source for indigenous communities, are important to the fishing industry as a lobster baitfish, and to local businesses that sell smoked alewife as food.

The International Rainy-Lake of the Woods Watershed Board has been developing an international, web-based StreamStats model for the watershed, which should be completed in spring 2018. This project will provide estimates for peak-flow statistics, and assist in floodplain mapping and other water resource planning and management applications. The US Geological Survey agency had an existing StreamStats model for the watershed on the United States side of the border, and this IWI project brings the model to the Canadian side of the border, harmonizing Canadian data with the US data to paint a complete picture available to researchers and water managers in both countries. Similarly, US data would be included in Canadian models of the basin created by the National Hydro Network. More information on this can be found in the Data Harmonization section of the Commission's website.

Data Harmonization

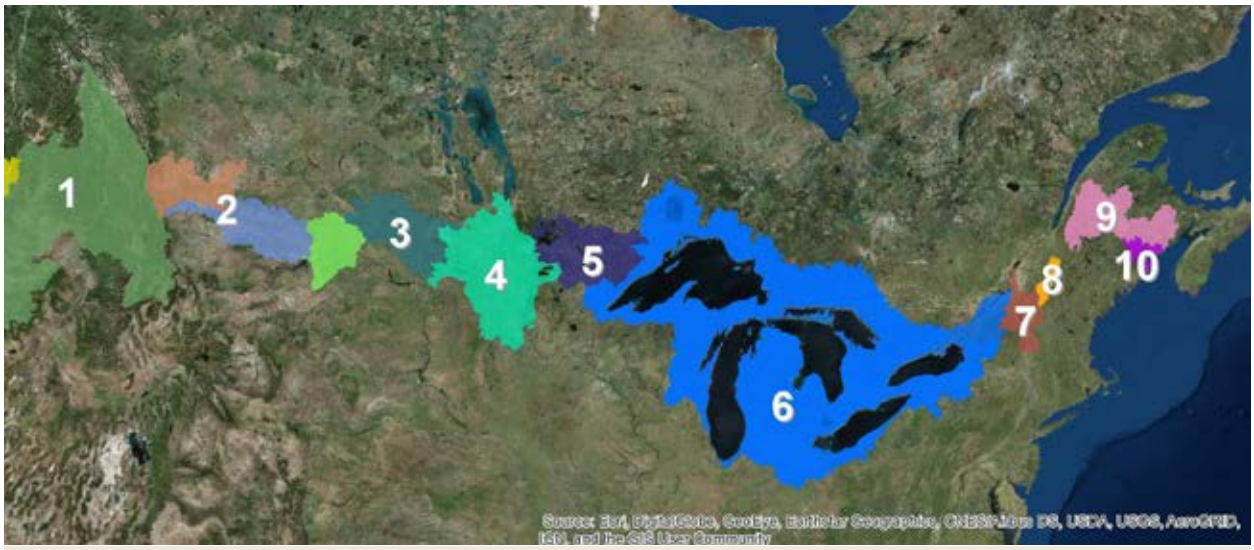
Status of the Transboundary Data Harmonization Project as of October 2017. The Data Harmonization Task Force worked on harmonizing datasets and models for the St. John and Lake Champlain-Richelieu River in 2017. Credit: Data Harmonization Task Force

Hydrographic data harmonization efforts by governments across the transboundary region continued in 2017, and the development of a seamless hydrological model between the two nations' datasets is being developed in the eastern region of the transboundary. The Lake Champlain-Richelieu River is the pilot area for that model.

The Hydrographic Data Harmonization Task Force, an ad-hoc group of Canadian and US government agencies facilitated by the Commission, held a workshop on October 24 in Ottawa for Commission board members and staff. The workshop provided background information and case studies on what's been done thus far to harmonize US and Canadian hydrological data and how this data can be uniquely customized for each board's needs, and provided an opportunity for the boards to provide feedback to the task force on specific requirements to help in their work.

Climate Change Framework

The Commission continued development of a framework to help its boards along the transboundary deal with the effects of climate change within each board's mandate. A pilot study to test this climate change framework took place in the St. Croix watershed in 2017 using the best available science and stakeholder input to get an idea of what climate stressors may be coming in the future, and how current regulation plans may need to be adjusted to account for those stressors. This study utilized the different steps of the Commission's Climate Change Framework: organize, analyze, act, and update. This involved setting critical thresholds in the form of the board's water minimum and maximum targeted flows and water levels, assessing how those would perform across a variety of plausible future scenarios (inputting historical data and potential climate change conditions into computer models), and seeing what might need to be changed. The project found that lake levels in the watershed are sensitive to precipitation changes leading to maximum water level violations, but there's a higher risk of minimum flows downstream. The board is currently looking at what recommendations may be needed to adjust water levels and flow, and a final report on this study will be provided to the Commission at a later date. Under the climate change framework, the St. Croix board is considering doing this process again in five years to keep it current.



The IJC has established boards and task forces that work in transboundary basins along the Canadian-U.S. border.

TRANSBOUNDARY BOARDS	
Health Professionals Advisory Board	The board provides advice to the Commission on public health issues related to the waters of the Great Lakes basin and other locations where the Commission reports on water quality.
1: Columbia River Basin	
International Osoyoos Lake Board of Control	The Osoyoos Lake board monitors water levels on Osoyoos Lake – which straddles British Columbia and Washington State – and whether water managers operating the Zosel Dam downstream are following the IJC's order of approval.
International Kootenay Lake Board of Control	The board supervises the operation of the Corra Linn Dam in British Columbia, and makes sure the conditions set for Kootenay Lake's water levels are maintained. Upstream of the lake, the Kootenay River flows from British Columbia into Montana and Idaho, before turning north again.
International Columbia River Board of Control	The board monitors the effects of the Grand Coulee Dam, located in Washington, on the water levels upstream up to and above the US-Canada border.
2: St. Mary and Milk Rivers	
Accredited Officers of the St. Mary and Milk Rivers	The Accredited Officers are tasked with the measurement and apportionment of water from the linked river systems, which run through Montana, Alberta and Saskatchewan.
3: Souris River Basin	
International Souris River Board	The board monitors compliance with the interim measures for apportionment of waters from the Souris River at its international boundary crossings between Saskatchewan, North Dakota and Manitoba. It also assists with the implementation and review of the joint water quality monitoring program and performs an oversight function for flood operations in the basin. The board also reports on ecosystem health and informs the Commission of water use and water-related development activities in the Souris River basin.
International Souris River Study Board	The Souris River study board was established to assist with reporting on the July 2017 reference to review the operating plan contained in the 1989 Canada US Souris River Agreement. It is investigating flooding and water supply issues in the Souris River basin.

4: Red River Basin	
International Red River Board	The board informs the Commission of basin-wide activities that may affect water levels and flows and water quality and ecosystem health, as well as monitors the implementation of flood-related recommendations by the Commission. The river is located between North Dakota, Minnesota and Manitoba.
5: Lake of the Woods and Rainy River Basin	
International Rainy-Lake of the Woods Watershed Board	The board oversees compliance with Commission orders on emergency water levels and flows in the Rainy-Namakan system, and assists with reporting on water quality in the boundary waters of the watershed.
6: The Great Lakes	
Great Lakes Water Quality Board	Created by the Great Lakes Water Quality Agreement, the board assists the Commission with assessing progress to meet the goals of the agreement and carrying out its other functions assigned under the agreement.
Great Lakes Science Advisory Board	The board provides scientific advice to the Commission and the Great Lakes Water Quality Board, and is responsible for developing recommendations on all matters and research related to Great Lakes water quality.
International Lake Superior Board of Control	The board oversees the operation of control works on the St. Marys River that control the outflow of Lake Superior at Sault Ste. Marie, located between Michigan and Ontario.
International Niagara Board of Control	The board monitors the operation of the Chippawa-Grass Island Pool control structure above Niagara Falls between Ontario and New York, and supervises the annual installation and removal of an ice boom at the outlet of Lake Erie.
International Lake Ontario-St. Lawrence River Board	The board ensures that outflows from Lake Ontario through the Moses-Saunders Dam – located between New York and Ontario – meet the requirements of the IJC order.
Great Lakes-St. Lawrence River Adaptive Management Committee	The committee maintains an awareness of the monitoring needed to support the ongoing modeling and evaluation of the regulation of water levels and flows in the Great Lakes. The committee reports to the three Great Lakes control boards.
7: Lake Champlain and Richelieu River Basin	
International Lake Champlain-Richelieu River Study Board	The Lake Champlain-Richelieu River Study Board is assisting the Commission in responding to the references from governments to explore the causes, impacts, risks and solutions to flooding in the watershed.
8: Lake Memphremagog Basin	
In close cooperation with local experts and basin organizations, the Commission is examining nutrient loading and harmful algal bloom issues in Lake Memphremagog (and Lake Champlain) and will make recommendations on how current efforts can be strengthened and improved.	
9: St. John River Basin	
International St. Croix River Watershed Board	The board maintains an awareness of the Commission's order of approval for the Grand Falls dam.
10: St. Croix River Basin	
International St. Croix River Watershed Board	The board reports to the Commission on compliance with water quality objectives in the boundary waters and on ecosystem health in the watershed, and ensures the four privately owned dams are operated consistently with conditions set by the Commission Orders.

Chapter III: The Great Lakes

The Triennial Assessment of Progress Report

In November the Commission issued its first *Triennial Assessment of Progress* (TAP) report to governments under the 2012 *Great Lakes Water Quality Agreement*. This report looks at what Canada and the United States have done to accomplish various objectives laid out in the agreement, notably wastewater and drinking water infrastructure, reducing nutrient runoff, guarding against chemicals of mutual concern and defending against invasive species.

Canadian Co-Chair Gordon Walker welcomes a crowd of people to a roundtable public meeting about the Triennial Assessment of Progress report in Sarnia, Ontario on March 2017. Credit: Commission

The report found that much progress has been made but that more investment and effort is needed to achieve the goals of the agreement. Commission recommendations include more investment in infrastructure improvements to reduce human exposure to untreated waste and to prepare for extreme storm events, accelerating work on strategies to identify, eliminate or reduce chemicals of mutual concern in the Great Lakes, creating enforceable standards for nutrient loading in the domestic action plans to reduce algal blooms in western Lake Erie, and setting a goal of completing all work on Areas of Concern in the next 15 years. The Commission recommends governments improve public engagement, accountability and funding to better achieve the agreement's objectives, which would include greater engagement with diverse communities and with Tribal, First Nations and Métis governments and more financial investment in restoration and prevention work. The Commission also issued a highlights report with its recommendations, a technical appendix detailing how the Commission reached its conclusions and a summary of public comments appendix. All of these and the TAP itself are available to the public in the reports section of the Commission's website, www.IJC.org.

Lake Ontario-St. Lawrence River Flooding

The International Lake Ontario St. Lawrence River Board followed Plan 2014 Plan 2014 starting in January. The plan provides guidelines to manage Lake Ontario's outflows into the St. Lawrence River, providing more natural variations in water levels to restore ecosystem health. Its implementation unfortunately coincided with the severe weather events leading to flooding on Lake Ontario and the St. Lawrence River; the plan balanced water supplies upstream and downstream of the Moses-Saunders Dam and reduced flood damages.

A mild winter, a record-setting wet spring, and unprecedented flooding on the Ottawa River caused water levels to surpass previous record levels for several weeks, leading to damaging floods throughout shorelines on Lake Ontario and the St. Lawrence River.

Several periods of warmth between more wintery weather made it difficult for a safe, solid ice cover to be maintained, preventing water managers from passing water through the system as quickly as they'd have liked in preparation for spring. A record spring freshet on the Ottawa River led to severe flooding in

Floodwaters from the St. Lawrence River reach up to a house in Brockville, Ontario May 7. Credit: Commission

Members of the New York National Guard put down a flood control fabric tube system on Lake Ontario's Braddock Bay to hold back floodwaters June 1. Credit: New York National Guard

Gatineau and in Montreal, where the Ottawa empties into the St. Lawrence River, and further downstream, which in turn limited water managers' ability to deal with water from Lake Ontario without worsening the flooding in Quebec. Months of rain in the spring throughout the region brought even more water for managers to deal with. Five-month January through May precipitation records were smashed in Rochester, Toronto, Belleville, Ottawa, and Montreal, which reflects how widespread the wet conditions were. The April-May water supplies to Lake Ontario were the highest ever recorded, and the Ottawa River flow surpassed the previous record for four consecutive days in May, breaking the previous record by 8 percent on May 8. Dam operators and the International Lake Ontario-St. Lawrence River Board spent months undertaking extraordinary measures to minimize flood and erosion impacts throughout the system and move water out of Lake Ontario and the St. Lawrence River. Water levels started declining in June, and drier weather conditions in late summer helped accelerate that decline.

Despite the board's best efforts, low-lying developments in New York, Ontario and Quebec experienced months of flooding and accelerated erosion. The board is undertaking a self-assessment to see what, if anything, it could do differently in future flood years to minimize damage. The board found that with the exceptionally wet conditions in 2017, flooding would have occurred under any regulation plan.

Great Lakes Water Quality Board

The Great Lakes Water Quality Board developed and adopted an Indigenous Peoples Engagement Principles and Practices policy, to be used by the board to guide its work, and to serve as an example of how people working within the constraints of western institutions can genuinely engage with Indigenous peoples in the Great Lakes basin. These principles and practices enable the board to better assist the Commission in meeting its responsibilities under the *Great Lakes Water Quality Agreement* to engage with Tribal, First Nations and Métis peoples in relation to data, scientific research and the provision of advice to the Parties. Moreover, the board is interested in incorporating traditional ecological knowledge into all its future projects.

Great Lakes Water Quality Board members and the public came together to discuss local and regional water quality issues in Ottawa on October 24. Credit: Commission

The board's Emerging Issues Workgroup completed a project in January entitled *Climate Change and Adaptation in the Great Lakes*, providing recommendations for adapting to climate change. Recommendations include conducting a binational climate change impact vulnerability assessment to address threats in the report, creating a staff-supported climate adaptation and resiliency network to coordinate activities from multiple agencies, and developing a binational approach in cooperation with other governments and organizations to coordinate climate change adaptation and ecological resiliency work in the Great Lakes.

The Water Quality Board and its Legacy Issues Work Group completed its *Addressing Polybrominated Diphenyl Ethers* (PBDEs) *in the Great Lakes Basin: Searching for Solutions to Key Challenges* report, which will be released in early 2018. The report made recommendations for finding alternatives to PBDEs as a flame retardant and avoiding the release of the chemicals during product use, recycling and disposal. The board's recommendations stand as a supplement to the Commission's 2016 PBDE report. The Legacy Issues Work Group also held a workshop February 1-2 with 30 experts in the field of watershed management planning and implementation. This workshop was to build support for the board's recommendations in its 2016 report *Evaluating Watershed Management Plans – Nutrient Management Approaches in the Lake Erie Basin and Key Locations Outside of the Lake Erie Basin*, to identify ways in which watershed planning could be better coordinated or optimized, and to provide a forum for those involved in watershed planning and implementation to better understand their connection to each other and to begin building relationships for coordinated watershed planning.

The board also held a public engagement event in Ottawa in October, including a panel and audience discussion on current and emerging environmental challenges facing watersheds at local, regional and global levels. That discussion looked at ways to accomplish effective watershed planning in governance from the Ottawa River to the Great Lakes basin.

Finally, the board contributed review and input to the Commission's *First Triennial Assessment of Progress* (TAP) Report and Technical Appendix. The board also provided suggestions to the Commission for improving the process to develop the second TAP report.

Great Lakes Science Advisory Board

The Great Lakes Science Advisory Board provides advice on research to the International Joint Commission and to the Great Lakes Water Quality Board. It also provides advice on scientific matters referred to it by the Commission, or by the Great Lakes Water Quality Board in consultation with the Commission. The Science Advisory Board is composed of two committees: the Research Coordination Committee and the Science Priority Committee.

Members of the Science Advisory Board's Science Priority Committee present to commissioners during the spring semiannual meeting in Washington, DC. Credit: Commission

Many of the recommendations from the Research Coordination Committee's (RCC) *Future Improvements to Great Lakes Indicators* report released in

December 2016 were incorporated into the Commission's TAP report, such as assessing the condition of drinking water sources, measuring nearshore predator abundance, and measuring loading of total and dissolved phosphorus.

The RCC has been working closely with the Parties to support many of their binational Great Lakes programs. These include financial support and assistance to the Lake Erie Cooperative Science and Monitoring Initiative workshop for identifying management and research priorities, and organizational and financial support of the Great Lakes monitoring and research vessel manager coordination workshops.

The RCC's projects active in 2017 included an update to the Great Lakes research inventory system, in a bid to improve the quality and quantity of data being collected related to the Great Lakes Water Quality Agreement. In addition to having data on hand, this updated system will provide a portal to other research databases and provide information on resource expenditures. The new version of the site went into testing at the end of 2017, and is expected to be finished by March 2018.

The RCC also worked on projects pertaining to adaptive management of nutrients in the Great Lakes basin with a focus on Lake Erie, integrating groundwater and surface water models to get a clearer picture of the overall water system, and improving binational monitoring and scientific research initiatives.

The RCC and the Science Priority Committee (SPC) jointly worked on a "Great Lakes Early Warning System" framework to identify environmental threats. This project will identify and prioritize emerging stressors and threats to the physical, chemical and biological integrity of the lakes, and develop advice and recommendations to the governments, through the Commission, to mitigate or prevent the potential impacts of identified stressors and threats. The project will benefit from an expert workshop to be held in 2018.

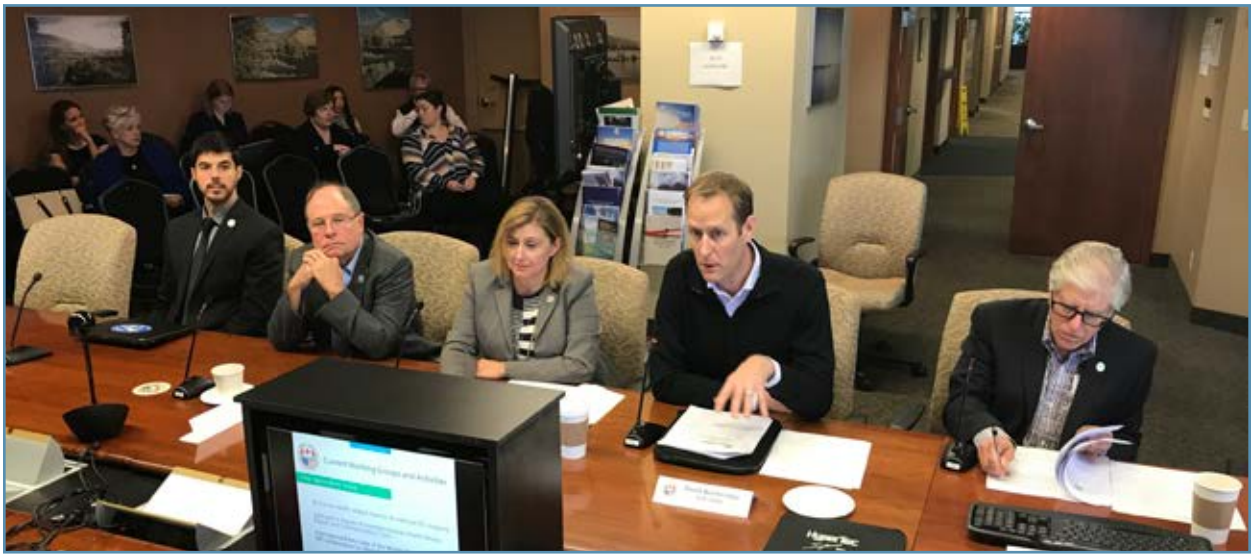
In 2017 the SPC completed its Information Coordination and Flow project, which examined opportunities to improve the use of environmental monitoring data and information in decision making. Overall, the project found that Great Lakes science and management organizations do a much better job at collecting and managing data than they do delivering timely and useful information to individuals whose decisions affect Great Lakes water quality. The report is available on the Great Lakes Science Advisory Board website.

The SPC has completed its project on the relative influence of agricultural sources of commercial fertilizers and manure on the western Lake Erie basin. The analysis also assesses the capacity of current monitoring programs and watershed models to understand agricultural sources of phosphorus, examines other factors influencing phosphorus delivery to the lake (like legacy soil phosphorus and drain tiles), and identifies science gaps. A final report from the Commission is expected in early 2018.

The SPC also reviewed the potential impacts of unrefined liquid hydrocarbon (such as crude oil) transportation on Great Lakes water quality and ecological processes. That report will be completed in 2018.

Finally, the SPC is finishing a research project to better understand observed declines in offshore productivity in some of the Great Lakes, including how nutrients move through the food web and are being redistributed within lakes. This project is expected to influence the management decisions associated with balancing nearshore nutrient enrichment (and their associated algal blooms) with declining offshore productivity including fish biomass. A final report is expected in 2018.

Health Professionals Advisory Board



Canadian Co-Chair David Buckeridge talks about the Health Professionals Advisory Board's activities during the Commission's fall semiannual meeting in Ottawa. Credit: Commission

The Health Professionals Advisory Board released a report in February assessing cyanobacteria in the Great Lakes and their associated toxins – and how these can impact human health. The report explains the challenges that agencies charged with maintaining drinkable and swimmable waters face with these toxic harmful algal blooms. The board makes a number of recommendations in the report, including improvements to water treatment technology to remove cyanobacterial toxins, robust monitoring of toxins in the source water, and more research focused on how best to treat water exposed to those toxins.

The board provided review and input to the Commission's TAP report and Technical Appendix. Based on the board's 2014 report entitled *Recommended Human Health Indicators for Assessment of Progress on the Great Lakes Water Quality Agreement*, the Commission submitted its report to governments in 2017. The Commission recommended standardized methods to assess contaminant levels in the edible portions of fish for use as an indicator. The Parties have partially implemented this recommendation, reporting basin-wide and lake-by-lake levels and trends for select contaminants in five species of fish deemed of interest for human consumption. This report also highlighted the importance of source water indicators to human health, and originated the Commission's source water recommendations in the TAP: that the Parties monitor and report on source water quality for drinking water.

The board is laying the groundwork for a review of water quality and human health in the Great Lakes as a follow-up to work originally conducted by the Commission in 1912-1914. A proposed "centennial" study would look at new tools and resources, and would help to describe how water quality and related human health outcomes have changed over the past century, as well as where future investments could be made. An expert workshop is planned for 2018.

The board completed the first phase of a review of environmental factors and their influence on waterborne gastrointestinal illness in four cities that source drinking water from the Great Lakes. The first phase assessed the feasibility of obtaining appropriate data and examined the challenges associated with the replication of such studies; a second phase will move forward in 2018.

Communications Strategy on Great Lakes Water Quality

People crowded a meeting room in the University of Toledo Lake Erie Center March 23 to give their input on the draft Triennial Assessment of Progress report, and the US-Canada Progress Report of the Parties released in 2016. Credit: Commission

The *Great Lakes Water Quality Agreement* gives responsibility to the Commission to raise public "awareness of the inherent value of the Waters of the Great Lakes, of the issues related to the quality of these waters, and the benefit of taking individual and collective action to restore and protect these waters."

The Commission invited public comment on the *US-Canada Progress Report of the Parties* and published a draft version of its *Triennial Assessment of Progress* report in January. The Commission asked members of the public to offer their comments and suggestions on this draft report, either online through www.ParticipateIJC.org or email, or by attending one of the public meetings that took place in March, held in Sault Ste. Marie, Detroit, Sarnia, Toledo, St. Catharines and Buffalo. In total, more than 743 people participated in the meetings, and more than 150 people commented online. Others participated in the review and comment process via social media, the Commission's *Great Lakes Connection* newsletter, and by watching the live stream video of the Great Lakes Public Forum held in the fall of 2016. The Commission also held a listening session in Sault Ste. Marie with indigenous communities and a roundtable discussion with community advocates and scientists in Detroit. When the TAP report itself was released, the Commission produced promotional videos to explain the report's findings and recommendations, which were widely viewed and shared on social media and through *Great Lakes Connection*, which is the Commission's newsletter on Great Lakes issues. The newsletter's December issue, as well as subsequent issues through mid-2018, summarizes the Commission's findings in key areas in greater detail.

The Commission's effort to increase visibility of its communications through social media platforms has continued to exceed expectations. The Commission's primary Twitter account, @IJCSharedWaters, ended 2017 with 3,810 followers, an annual increase of 30 percent. Its Facebook account grew by almost 2,000 followers, a 114 percent increase over 2016, ending the year with 3,720 followers. The Commission's monthly *Great Lakes Connection* and quarterly *Water Matters* newsletters saw continued success. The newsletters received a total of more than 1,200 new subscribers, and above-average open rates on articles. The Commission published 12 issues of *Great Lakes Connection* and four editions of *Water Matters* in 2017.

Work on a new modernized website for the IJC continued in 2017, with a rollout date anticipated for mid-2018.

Chapter IV: Additional Highlights

Remembering Former US Co-Chair Thomas L. Baldini

1943-2017

Tom Baldini of Marquette, Michigan served as US co-chair of the International Joint Commission from 1994 to 2002. Major projects completed under his leadership include a study of the historic 1997 Red River flood, recommendations to protect the Great Lakes waters from diversion and over-exploitation, and a vision for the Commission in the 21st century. During this time, Baldini also served as US Commissioner of the International Boundary Commission.

Baldini taught government and was an assistant administrator at Marquette Senior High School. He later served as Governor James Blanchard's representative for Michigan's Upper Peninsula. In that role he participated in major economic development decisions and advised the governor on negotiation of the Great Lakes Charter and Great Lakes Toxic Substances Control Agreement. After leaving the Commission, Baldini taught in the Political Science Department at Northern Michigan University and was elected mayor of Marquette.

Former US Co-Chair Tom Baldini speaks during a Commission reception in September 1994. Baldini passed away December 26, 2017. Credit: Commission

According to James Blanchard:

> "He was always there for his people, his friends, his neighbors, colleagues and students. He touched thousands of lives. Teacher, educator, public official in Marquette, Lansing and Washington, Tom Baldini was a public force and leader for the last half century. I met him in 1970. He was already a walking advocate and ambassador for the U.P. Of course he was an expert on U.P. issues; jobs, tourism, schools, the Great Lakes, and US Canada relations. I called him my 'Governor of the U.P.' My staff agreed! Knowledgeable, dedicated to serving the public and a mentor to future leaders, he energized everything he touched. Oh how we will miss him. What a great and wonderful life to celebrate!"

Baldini is remembered by all for his dedication to public service.

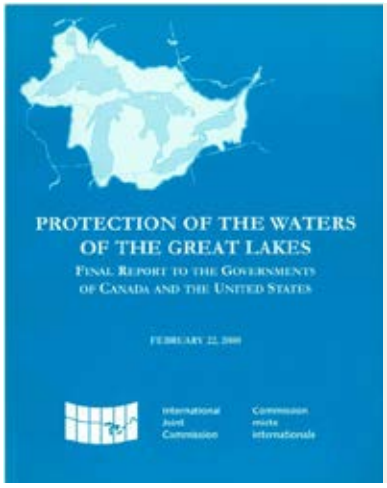
Remembering Former Canadian Co-Chair Leonard Legault

1935-2017

Leonard Legault, Order of Canada recipient, Queens Council, Canadian Ambassador to the Holy See, a career diplomat, served as Canadian Chair of the International Joint Commission, from March 10, 1997 to March 2001.

During his tenure the Commission reported on two applications on the Niagara River (Peace Bridge – and Niagara River Hydro Tunnel expansions in 1998) and the reference on the design of the International Watershed Boards and Initiative.

Former Canadian Co-Chair Leonard Legault passed away on March 17, 2017 following a distinguished career with the Department of External Affairs. Credit: Commission



Canadian Chair Legault, along with US Chair Tom Baldini, was the principal drafter of the seminal and still very popular IJC report the Protection of the Waters of the Great Lakes (2000), dealing with the issues of bulk water diversions and consumptive uses. The report was recently updated in 2015.

Canada's Governor General Romeo LeBlanc seeing him in an audience once noted:

> "I hope you will forgive a passing mention of Leonard Legault ... in winning our Atlantic boundary settlements with the United States and France. I will just say that in my opinion we are a bigger country today, in terms of territory and in terms of justice, because of Leonard Legault."

Mr. Legault was 81 years old.

Board and Staff Members Completing Service

Several board members completed their service in 2017, leaving a legacy of volunteer service and expertise:

- Nolan Baratono, International Rainy-Lake of the Woods Watershed Board, 2015-2017
- Denis Brown, International Rainy-Lake of the Woods Watershed Board, 2013-2017
- Glen Davidson, Osoyoos Lake Board of Control and Kootenay Lake Board of Control, 2004-2017
- Lori Dowling-Hanson, International Rainy-Lake of the Woods Watershed Board, 2013-2017
- Tareq El-Zabet, Great Lakes Science Advisory Board – RCC, 2015-2017
- Rob Fleming, Great Lakes Water Quality Board, 2014-2017
- Marcel Gaucher, Great Lakes Water Quality Board, June-December 2016
- Norm Granneman, co-chair of the Great Lakes Science Advisory Board – RCC, 2009-2017
- Brian Grantham, Great Lakes Science Advisory Board – RCC, 2007-2017
- Dean Jacobs, Great Lakes Water Quality Board, 2014-2017
- Herm Martens, International Red River Board, 2005-2017
- Betty Matthews-Malone, Great Lakes Water Quality Board, 2014-2017
- Michael Ripley, Great Lakes Water Quality Board, 2014-2017
- Steven Topping, International Red River Board, 2001-2017

Commissioners wish to recognize with appreciation the staff members who completed their service in 2017:

- David Dempsey, Policy Advisor, US Section
- Shannon Runyon, Senior Advisor, US Section
- Allison Voglesong, IJC Sea Grant Fellow, Great Lakes Regional Office

The Commission would also like to recognize with appreciation the students and interns who served in 2017:

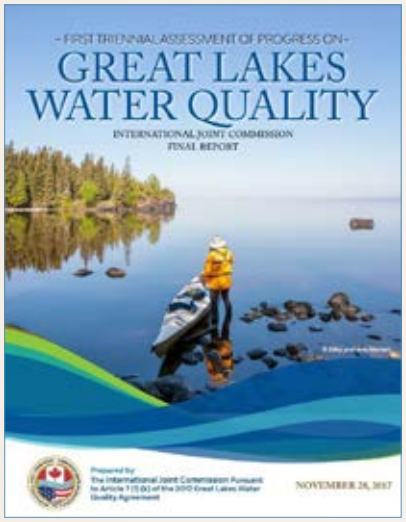
- Kirsten Aleksejev, Policy Intern, Canadian Section
- Robyn Barabash, Legal Intern, Canadian Section
- Alex Bradburn, Policy Student, Canadian Section
- Dharni Grover, Scientific Intern, Great Lakes Regional Office
- Iman Hersi, Records Management Student, Canadian Section
- Anne Hobdy, Records Management Project Student, US Section
- Emma Hobdy, Records Management Project Student, US Section
- Christopher Holland, GIS Student, Canadian Section
- Maeesha Ibnaat, Records Management Student, Canadian Section
- Trevor Neiman, Legal Intern, Canadian Section
- Michelle Randall, Records Management Student, Canadian Section
- Megan Sanders, Public Affairs Intern, US Section
- Dahlia Shuhaibar, Legal Intern, Canadian Section
- Gabriel Snow, Policy Student, Canadian Section
- Cassandra Stea, GIS Student, Canadian Section
- Kevin Strauss, GIS Student, Canadian Section
- Patrick Therrien, Legal Intern, Canadian Section
- Trevor Wilkinson, Policy Intern, Canadian Section
- Erika Woolner, Records Management Student, Canadian Section
- Maaha Zia, Records Management Student, Canadian Section

Reports to Governments

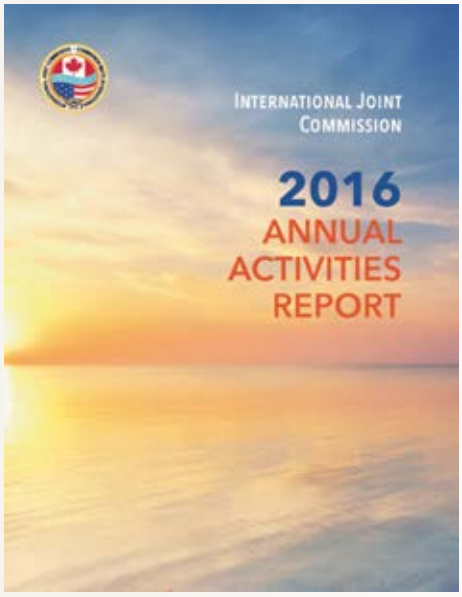
Throughout the year, the Commission issued reports to governments on a variety of topics, several of which were covered in previous sections of this report.

Triennial Assessment of Progress – This report summarized the Commission's findings on how the parties to the *Great Lakes Water Quality Agreement* have fared in meeting the goals set out in that document. It includes a number of recommendations on how Canada and the United States could improve their work to improve the health of the Great Lakes. More information can be found in the Triennial Assessment of Progress section.

International Joint Commission's Recommendations on Microplastics in the Great Lakes – This report gives recommendations on how the United States and Canada can deal with the issue of microplastics in the Great Lakes, based on a scientific workshop held in Windsor by the Commission on April 26-27, 2016. Microplastics are pieces of plastic 5 millimeters in size or smaller, and can take the form of microbeads from personal care products, fibers from synthetic clothing, larger pieces of plastic that have degraded, and pre-production powders and pellets.



Triennial Assessment of Progress and the Great Lakes Water Quality Agreement



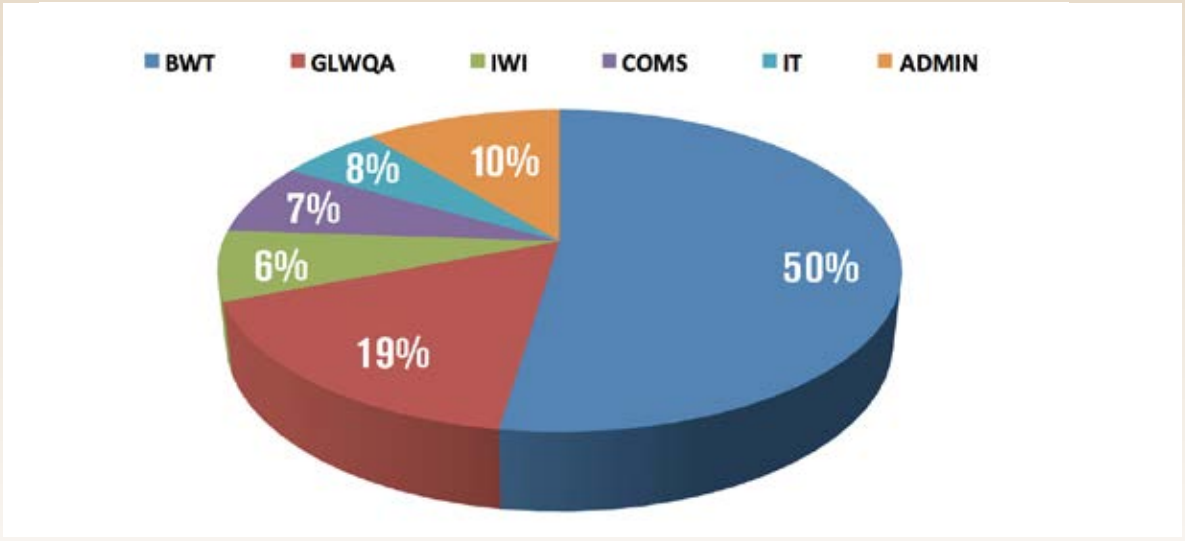
2016 Activities Report – This report summarizes activities performed by the Commission and associated boards and task forces during the 2016 calendar year.

Financial Summary

The Commission is funded by the United States and Canada directly through the US and Canadian IJC section offices in Washington, D.C. and Ottawa, Ontario, as called for in the Boundary Waters Treaty. Commission expenditures in 2017 reflect US Fiscal Year Oct. 1, 2016-Sept. 30, 2017, and the Canadian Fiscal Year April 1, 2016-March 31, 2017, and are reported in U.S. and Canadian dollars with no adjustment for the exchange rate. For the purposes of this report, Commission expenditures are reflected in six categories.

Expense Area	Combined Expenditures
BWT	$6,872,000
GLWQA	$2,553,000
IWI	$860,000
COMS	$995,000
IT	$1,076,000
ADMIN	$1,311,000
Total	**$13,667,000**

BWT:	Work under Boundary Waters Treaty references and applications outside the Great Lakes Water Quality Agreement
GLWQA*:	Work under Great Lakes Water Quality Agreement
IWI:	International Watersheds Initiative project funding
COMS:	Communication activities
IT:	Information technology and support
ADMIN:	Administrative costs



* Each section's budget contributes funds in the amount to $1.6M for the Great Lakes Regional Office, which includes funds for operations, Communications, Administration and Information Technology.