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Résumé de l'article

Au tournant du vingtième siècle, la pollution de l'eau était le premier vecteur de propagation des maladies hydriques et une menace à la santé publique. En 1910, le taux de mortalité imputable à la fièvre typhoïde atteignait, dans le bassin des Grands Lacs, un niveau sans précédent, ce qui incita les responsables fédéraux et provinciaux de la santé publique à organiser un congrès sur la question. Trois initiatives connexes en résultèrent : amendement de la *Public Health Act* en 1912 par le gouvernement provincial; tentative de mise au point d'une législation nationale de contrôle de la pollution entre 1912 et 1915 par les législateurs fédéraux et en 1912, enquête sur la pollution transfrontière par la Commission mixte internationale qui recommanda l'élaboration d'une convention afin de contrôler la pollution. De ces trois initiatives, seuls les amendements à la *Public Health Act* se concrétisèrent. En 1915, suite à l'adoption quasi universelle du traitement au chlore des réserves d'eau municipales, on avait réussi à contrôler efficacement la propagation des maladies hydriques et on ne sentait plus le besoin de prendre d'autres mesures à cet effet.

'A Sort of Destiny': The Multi-Jurisdictional Response to Sewage Pollution in the Great Lakes, 1900–1930

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ABSTRACT:

At the turn of the twentieth century, water pollution was the primary vector spreading waterborne disease and a public health issue. In the Great Lakes basin, unprecedentedly high mortality from typhoid fever prompted a conference of federal and provincial public health officials in 1910. Three related initiatives resulted: the provincial government amended the *Public Health Act* in 1912; federal legislators attempted to develop national pollution control legislation between 1912 and 1915; the International Joint Commission investigated cross boundary pollution in 1912 and recommended a convention to control it. Of the three initiatives, only the provincial *Public Health Act* amendments were carried to fruition. By 1915, the almost universal adoption of chlorine treatment for municipal water supplies effectively controlled waterborne disease and there was no longer a perceived need for further action.

RÉSUMÉ:

Au tournant du vingtième siècle, la pollution de l'eau était le premier vecteur de propagation des maladies hydriques et une menace à la santé publique. En 1910, le taux de mortalité imputable à la fièvre typhoïde atteignait, dans le bassin des Grands Lacs, un niveau sans précédent, ce qui incita les responsables fédéraux et provinciaux de la santé publique à organiser un congrès sur la question. Trois initiatives connexes en résultèrent : amendement de la *Public Health Act* en 1912 par le gouvernement provincial; tentative de mise au point d'une législation nationale de contrôle de la pollution entre 1912 et 1915 par les législateurs fédéraux et en 1912, enquête sur la pollution transfrontière par la Commission mixte internationale qui recommanda l'élaboration d'une convention afin de contrôler la pollution. De ces trois initiatives, seuls les amendements à la *Public Health Act* se concrétisèrent. En 1915, suite à l'adoption quasi universelle du traitement au chlore des réserves d'eau municipales, on avait réussi à contrôler efficacement la propagation des maladies hydriques et on ne sentait plus le besoin de prendre d'autres mesures à cet effet.

In the neighbourhood of cities and large towns, it has come to be thought that a river foul with sewage is inevitable, and it is more difficult to abolish or limit the evil when the principal offenders are known to be the municipal governing bodies. Rich and poor, therefore, calmly view the existence and perpetuation of the nuisance and submit to it as a sort of destiny.

— Commission of Conservation, Public Health Conference, October 1910¹

In October 1910 the Canadian Commission of Conservation hosted a conference of federal and provincial public health practitioners to address the Dominion's appalling typhoid fever mortality rates. That year the Canadian death rate from the disease was 35.5 per one hundred thousand persons. When compared to other countries, such as Scotland with 6.2, or England and Wales with 11.2 deaths per one hundred thousand people, clearly Canada faced a serious problem. Among western nations, only the United States surpassed Canada's grim statistics.²

While the medical community knew that water polluted by the faeces of typhoid carriers and patients was the primary vector spreading the disease, efforts to combat it were foiled by municipal politicians' reluctance to address the problem. At the turn of the century most people considered sewage fouled rivers and lakes in the vicinity of human settlement inevitable. This was an assumption that provincial and federal public health officials challenged. They were part of the wave of new professionals who attempted to instill uniformity and assert more centralized control over municipalities' social and physical infrastructure.³ The profession itself underwent an important transformation at the provincial level in 1912 that was, in part, prompted by provincial efforts to combat typhoid fever. At that time the part-time physicians who acted as local medical officers of health were replaced by provincially appointed doctors with public health training who answered directly to the provincial Board of Health.

Federal and provincial public health officials at the 1910 conference discussed which level of government was responsible for managing water pollution, specifically raw sewage, and how that management would take place. At this time the focus was not upon curbing pollution for its own sake; health officials focused instead on how to stop the spread of disease. Sewage was an important vector, therefore controlling pollution would control disease.

The government health officials attending the conference hammered out a tripartite plan to manage water pollution. As a first

step, they recommended the provinces amend their public health acts to take more rigorous control over the design and maintenance of municipal water and sewerage works. At the same time, it was clear that pollution in interprovincial waterways was beyond the capability of provincial governments to manage, so the conference recommended uniform national legislation to address that issue. Finally, conference attendees urged the federal government to work with its US counterpart through the International Joint Commission (IJC) and address pollution in the Great Lakes basin where the Canadian incidence of typhoid fever was highest.

Over the next five years federal and provincial politicians and public health officials attempted to implement the recommendations of the 1910 conference. Of all the suggestions, those devised for the provincial level were the most successfully executed. Despite the steady interest of federal legislators between 1912 and 1915, proponents of national legislation were not able to get it through the House of Commons. Similarly, the two federal governments considered a draft convention addressing the problem during the 1920s but allowed it to lapse in 1929.

An examination of the events precipitated by the 1910 public health conference will help explain why the typhoid issue, which had generated such initial interest, failed to maintain its hold long enough for either federal or international action to occur. As with many things the answer lies in timing. Although senators and MPs considered pollution legislation as early as 1912, a number of factors slowed federal legislative action for several years. This gave the opposition time to consolidate and force a further delay. Similarly, the two federal governments were slow to consider the IJC's pollution convention during the 1920s. While federal and international efforts moved slowly, Ontario public health officials took advantage of changes made to the provincial *Public Health Act* in 1912 to assert more control over municipal water filtration and treatment plants. While they were relatively ineffective at promoting the construction of sewage treatment facilities, the introduction of chlorine treatment for municipal water supplies enabled public health officials to significantly reduce the incidence of typhoid fever in the Great Lakes basin by the mid-1920s. This significantly curbed pressure on the federal government both to pass national pollution legislation and to conclude the convention with the United States.

The typhoid problem public health officials confronted in 1910 had emerged from a number of factors, but especially the combina-

tion of rapid urban growth and inability of local authorities to provide adequate water and sewerage facilities. Provincial efforts to ameliorate the situation were hampered by an inadequate legal and regulatory framework, resulting in an inability to impose uniformly safe standards in all communities. As the situation deteriorated, municipal politicians proved increasingly unwilling to cooperate with provincial health authorities.

Ontario's urban growth concentrated in the Great Lakes basin, where development on the U.S. side also outpaced water and sewerage capacity and contributed to the typhoid problem. The basin had proved an ideal location for industrial towns and cities, surrounded by rich agricultural land and linked to the resource-laden north and west by railroad and steamship. These factors, combined with relatively easy and cheap access to the rest of the world allowed industrial enterprise on both sides of the lakes to boom. Plans to enlarge harbours and channels to accommodate ocean-going vessels promised even more ships would come into the Great Lakes system.⁴ Tourism also increased in economic importance after 1900. Every year, scenic spots along the system, such as the Thousand Islands, received more visitors and boat traffic.⁵

Most cities in the Great Lakes basin drew their water supply from surface waters around them. Water and sewerage systems, if they existed at all, were often poorly designed, providing inadequate treatment and serving very few in the community. Water services were extended first to the industrial, commercial and wealthy residential neighbourhoods to protect valuable property against fire. Other members of the community were often left to draw their water from questionable water sources or polluted wells.⁶

Sewerage systems consisted of a small number of trunk lines which gathered sewage from those homes and businesses located along them. These systems were designed to release the untreated effluent downstream from the community's water intake pipe in an effort to maintain the integrity of the water supply. Although this proved a relatively successful practice for the originating community, the untreated effluent presented a menace to anyone drawing water downstream from the sewage outfall. While sanitary engineers relied upon dilution and oxidization to neutralize the effluent before it reached the intake pipe of the next community downstream, factors such as volume and distance made reliance upon these methods very risky. With ever increasing population density along the Great Lakes connecting channels, especially the St. Clair, Detroit and Niagara Rivers, such practices led to the

basin-wide high infection and death rates from typhoid fever (see Table One). In some locations, notably Chicago, fighting typhoid fever sent engineers to heroic lengths such as reversing the flow of the Chicago River to divert sewage away from the city's intake.⁷

Ontario public health officials' desire to control the growing incidence of typhoid fever formed a significant aspect of their struggle against local interests during the late nineteenth century. At this time, provincial officials attempted to assert central control over all issues related to public health by emphasizing the greater efficiency and scientific expertise of trained public health practitioners.⁸ Peter Bryce, an Ontario born and educated doctor who had undertaken advanced studies in Paris and Edinburgh, was appointed the first provincial medical officer of health by the first permanent Board of Health in 1882.⁹ Led by Bryce, the provincial Board investigated cases of disease and offered advice to local officials but, with very few local boards to carry out its directives, this central Board remained relatively ineffective. In 1884, therefore, the provincial Legislative Assembly amended the *Public Health Act* to make local boards compulsory and responsible for carrying out the regulations Bryce and the central Board established on a range of matters intended to keep areas of human habitation clean and disease free.¹⁰

Public health practitioners knew that protecting municipal water sources by collecting and safely disposing of sewage helped mitigate the spread of waterborne disease. Unfortunately, the water and sewerage facilities required to prevent these diseases received little priority as communities developed because they were long term financial commitments of little political value. This attitude frustrated Bryce, who declared, "[t]he fiction was apparently believed that all the sanitary requirements of a well organized community would spring up full armed like Athene from the brow of Jupiter."¹¹

Equally frustrated by apparent municipal indifference, Bryce's successor, Dr. Charles Hodgetts, repeatedly urged the provincial Board to seek "direct oversight and control of all [municipal] water systems, together with the streams, lakes and rivers from which the supplies are taken." The Board, he believed, should have the power to prosecute polluters, monitor water quality and hold corporations or owners of systems responsible for the protection of their water's purity.¹² Hodgetts was also frustrated by his inability to enforce provisions in the Act which obliged municipal authorities to submit plans for new or enlarged water or sewerage treatment

TABLE ONE
TYPHOID DEATH RATES
 Adjusted to an Average per 100 000 Population

Port Arthur	72	178	5;21 (1916)	26
Sarnia	33	101	34	21
Windsor	42	49	14	8
Niagara Falls	72 (1906)	60	9;27 (1916)	20
Welland	NA	85	14	21
St. Catharines	NA	24;71 (1911)	0;22 (1916)	5 (1919)
Hamilton	20	15	6	9
Toronto	18	46	2	2
Belleville	21	50	63	26
Kingston	38	78	28	7
Brockville	22	11	162 epidemic	22
Cornwall	30	64	77	144 epidemic

– Public health professionals considered a mortality rate at or above 24 per 100 000 a signal that the municipal water supply had been compromised.

Sources: IJC. *Progress Report, 1914*, 358–59 and Ontario Board of Health. *Thirty-ninth Annual Report of the Provincial Board of Health of Ontario, Canada for the Year 1920* (Toronto: King's Printer, 1921), 116–117.

facilities for Board approval. In many cases, he learned of new works only after they had been completed. But even if the plans had been submitted for Board approval prior to their construction, he had no way to ensure that Board ordered changes were incorporated into the project.¹³ To complicate matters further, municipal politicians rarely looked beyond their town limits. As Hodgetts charged, municipal politicians “care nothing as to how great a nuisance...[their] sewage effluent may be to others, or how many lives may be lost by reason of typhoid carried to adjoining municipalities.”¹⁴

Municipal governments were willing to defy provincial directives to spend money on matters which they believed were too expensive or unnecessary for their community, such as sewage treatment facilities.¹⁵ Many municipal officials believed that to

oblige a city to “purify its sewage, so that it will not affect prejudicially the stream into which it is discharged is to place an embargo upon the growth of that town.”¹⁶ Most regarded sewage treatment plants as “an expense forced upon the municipality for the benefit of the surrounding township. It would be much easier for the town to empty its sewage as formerly into a river or creek,” and let the next town downstream worry about its water supply.¹⁷ From this perspective the cost of treating effluent did not offer a direct advantage to the community; instead, it benefited the next town downstream. How could municipal politicians justify spending their ratepayers’ taxes for the advantage of another community?

At the same time, however, the importance of maintaining the community’s good reputation dominated local politics, and politicians did anything they could to preserve the town’s real or illusory health. One of the more effective strategies was to locate better sources of water for the public supply. Initially community health could be protected by simply collecting all the sewage and releasing it well downstream from the intake pipe. By the turn of the century increasing population density had ensured that few surface water sources in populated areas of the Great Lakes basin were safe. Sanitary engineers urged municipal leaders to invest in water filtration systems when safe alternatives had been exhausted. They had determined that one dollar spent on water treatment was as effective as ten spent on sewage purification — obviously a solution as good for the public purse as for public health. Relatively early in the century municipal politicians, with the support of sanitary engineers, had already decided that focusing on water treatment was the best way to respond to the disease problems caused by sewage pollution.¹⁸ How ironic that in treating their drinking water most communities were treating another’s sewage.

When disease did break out, local leaders took great pains to keep the news quiet. This was an age when every city and town competed to attract manufacturing and service industries. Such pride made even local public health officers hesitant to pursue their responsibilities fully if they might undermine their community’s prestige or thwart an opportunity for growth, as would happen if their town became known as a disease-prone locale.¹⁹ A significant manifestation of this attitude was the tendency for local public health officers to under-report incidence of disease, especially typhoid fever. When they did inform the central Board, local health officers were quick to point out that many of the typhoid cases reported in their communities had originated

outside the city limits, but that treatment in their hospitals necessitated inclusion in their returns.²⁰

Even when health officers were conscientious in their duty, they could be undermined by other community members. Until well into the twentieth century, local medical officers only worked part-time, and most supplemented their income in private practice which depended upon personal popularity for success. If a doctor was too enthusiastic in executing his provincial office, his reputation within the community could suffer for "knocking the town." Local health officers found their medical colleagues hesitant to report cases of contagious or infectious diseases for similar reasons.²¹ Reluctance to admit that disease was a problem meant that the public pressure necessary to ensure expenditure on adequate sanitary infrastructure rarely coalesced at the local level.

Rapid urban growth at the turn of the century exacerbated already dangerous water management practices which focused on municipal water quality rather than sewage treatment. While provincial public health officials could point out the dangers inherent in those practices, they had no effective means to alter them. Responsibility for constructing sewage treatment plants rested with local governments where politicians were reluctant to spend tax dollars on expensive infrastructure that would not benefit the immediate community. Instead, they focused on protecting the water supply, by locating safe sources and building filtration plants. By 1910 the emphasis on treating and protecting water supplies was an established strategy for combatting water borne disease.

This strategy had an important flaw: municipal water rarely served the entire community thus compromising its effectiveness. Although sewage treatment promised substantially safer waters, especially as treatment technology developed, local politicians' reluctance to adopt this solution was almost intractable. The provincial Board of Health failed to secure the level of centralized control over pollution they required to manage disease. Consequently the typhoid problem escalated after the turn of the century (see Table One). More and more people crowded into towns and cities which did not have the water or sewerage infrastructure in place to sustain growing populations. In some cases the inhabitants were then forced to draw their water from streams and wells reduced to little more than open sewers.

The steady increase in typhoid fever mortality proved alarming to Senators in Ottawa. Their response, assigning the newly created standing committee on public health to investigate pollution in

March 1909, precipitated the 1910 Dominion-wide conference. After a study lasting the better part of a year, the committee concluded that the country required some form of legislation to manage the problem. However, it was at a loss about the form it should take and from what body it should emanate. At the same time (March 1910), Ottawa Senator Napoleon Belcourt introduced an amendment to the *Protection of Navigable Waters Act*. Pollution from Aylmer, Quebec threatened Ottawa's water supply but the capital city had no recourse. While provincial public health officials had some control over their own cities, in the case of pollution from communities in other provinces there was no higher authority to which they could appeal. Belcourt hoped his proposed amendment, designed to prevent pollution from sanitary and industrial wastes nation-wide, would help rectify the situation.²² Not certain that this was the correct solution either, the Senate health committee recommended that the newly created Canadian Commission of Conservation, as a body which represented both the federal and provincial governments, host a conference to consider the issue of pollution abatement generally and Belcourt's legislation specifically.²³

The Commission of Conservation's Public Health committee accordingly invited federal and provincial health officials to Ottawa for a two day meeting in October 1910. Among the attendees were provincial health officers from all provinces except Quebec, including Dr. John McCullough who had just replaced Charles Hodgetts as provincial secretary of Ontario. Hodgetts was also there as medical advisor to the new Commission of Conservation along with the other members of its Public Health committee, including the chairman, Edmund Osler, Minister of Agriculture Sydney Fisher, MP Henri Béland and Commission Chairman Clifford Sifton. Federal officials attending included Frederick Montizambert, Director General of Public Health, and Peter Bryce, who was now Chief Medical Officer of the Immigration Branch. Other federal representatives included the deputy minister of Labour, a member of the army medical corps, the pathologist from the central experimental farm and a representative of Inland Revenue. Senator George DeVeber, who chaired the Senate Public Health committee, also attended the meeting which brought together many of the experts his committee had consulted the previous year.²⁴

From the outset, Clifford Sifton urged attendees to view the gathering as a business meeting designed to achieve concrete rec-

ommendations for Parliament, rather than another opportunity to exchange scientific information. The problems associated with water pollution, as the Senate committee and Ontario public health officials had already discovered, were not simple. Sifton foresaw potential jurisdictional problems because of the constitutional distinction between federal responsibility for navigable waters and provincial responsibility for all others. The trick would be in conceiving an effective and enforceable legislative solution.²⁵

An initial general discussion clarified the issues. Inter-jurisdictional waters proved to be the most significant question the conference addressed. Provincial representatives readily admitted that managing pollution in interprovincial and international rivers and lakes was beyond them. For instance, what could Alberta do about pollution which crossed the border from Montana via the St. Mary river? When Aylmer polluted the water above Ottawa, who could the city approach to rectify the situation? Provincial medical health officers were unanimous in the desire to see a regime of uniform federal legislation and regulations as well as international co-operation to address the problems which they could not manage.²⁶

After the issues had been defined, attendees broke into smaller committees to consider specific issues. The water pollution committee recommended that the provinces add a clause to their health acts to make it impossible for municipalities to finance water and sewerage systems without the consent of their provincial board of health. They urged provincial authorities to supervise municipal water and sewerage installations to ensure they functioned properly. Further, the committee recommended the federal government pass legislation to prevent raw sewage, garbage and factory wastes from being released into navigable waters and tributary streams. They appended draft legislation, supplied by Senator DeVeber, for Parliament's consideration. They also recommended that provincial legislative assemblies pass special legislation to prevent conflict with the proposed federal law. Finally, the committee urged the federal government to cooperate with the United States government to prevent further pollution of international waters.²⁷

Early in 1911 the Commission of Conservation sent the recommendations of the water pollution committee to the secretaries and commissioners of the provincial public health boards for their consideration. Replies from Alberta, Saskatchewan, Manitoba, Ontario, Prince Edward Island and Nova Scotia enthusiastically endorsed the recommendations and all pledged to do as much as

possible to implement the recommendations. The Quebec Deputy Attorney General indicated that the numerous important questions raised in the report would be carefully considered by his government.²⁸

Although the provinces were eager to cooperate with federal initiatives, other observers were less optimistic about the success of national pollution abatement measures. An editorialist in *The Globe* wondered what the best solution to the typhoid problem would be. While public health practitioners advocated sewage treatment as the best way to prevent typhoid from spreading, the editorialist felt obliged to point out, "the practice of pouring crude sewage into the great lakes [sic] and rivers has too firm a hold to be stamped out quickly." As long as pollution continued unabated, Canadians required an alternative: either unpolluted sources of water or better water treatment facilities. Tellingly, the writer predicted that "in another decade it will be impossible to find an up-to-date community along the shores of the inland waters that invites typhoid by pumping untreated water into the mains."²⁹ The writer stopped short of addressing the next logical question: with a safe and efficient treatment for water, why bother controlling sewage pollution?

Despite these misgivings, the Dominion Public Health conference had far reaching consequences. The conference's recommendations called for responses at the provincial, federal and international levels. With the added weight of the conference recommendations, Ontario's Legislative Assembly consolidated its public health legislation under a new *Public Health Act* in 1912 and included the clause designed by the water pollution committee to prevent municipalities from evading water and sewage treatment responsibilities. Prior to 1912 the Ontario Board had the power to order remedial water or sewerage works to address local health problems and could offer advice on the facilities. It had no power over what the community then chose to install, nor did it have much influence on the speed with which the solution was effected. The 1912 changes prevented municipalities from issuing debentures for water and sewerage works without the written approval of the Board's chairman and secretary. The amendment also made ongoing maintenance and improvements to local systems compulsory.³⁰ The 1912 Act blocked the two most significant means available to a community for circumventing central directives. No longer could a municipal government install substandard, and

therefore less costly, systems; nor could newly constructed facilities be left unattended or inoperative.

The Act also addressed the problems associated with local medical officers of health, when it divided the province into seven health districts — London, Palmerston, Hamilton, Peterborough, Kingston, North Bay and Fort William. The provincial board then appointed individuals specifically trained as public health professionals to supervise the sanitary work in each region. These district health officers were full-time provincial employees, freed of the need to maintain private practice, and presumably committed to uniform standards across the province.³¹ Their role included investigating incidence of disease, determining its cause, and ordering remedial measures. This included the new practice of treating municipal water supplies with chlorine.

The use of chlorine originated in Britain in 1897 as an emergency measure when municipal water supplies had been exposed temporarily to questionable sources. In the United States, on the other hand, it was embraced as a permanent solution after Jersey City sanitary engineers completed a successful installation in 1908.³² Some public health professionals, such as Charles Hodgetts, worried that permanent chlorine treatment would encourage pollution by focusing attention on water purification rather than sewage treatment.³³ But these people were in the minority because chlorine was plentiful, inexpensive and, when used properly, harmless to human health. All in all, chlorine appeared to be the ideal solution.

The new Ontario *Public Health Act* embraced the recommendations made at the 1910 Dominion Public Health conference and, in one fell swoop, met provincial secretaries' longstanding concerns. It reduced local control over the measures a community might take to ameliorate a pollution problem, giving the Ontario Board of Health power to order any municipality to construct remedial water or sewerage works. This included the installation of chlorine treatment for public water supplies. The design of the system had to meet the Board's approval before money could be raised to build it. Further, the Act made ongoing supervision of water and sewerage installations mandatory. The 1912 *Public Health Act* was designed to control water borne disease and, in the process, proved one of the most effective tools for water pollution control then available to any level of government in Canada.³⁴

The Dominion Public Health Conference also stimulated a response at the federal level. Among its recommendations had

been a call for uniform national pollution abatement legislation, a draft of which had been included with the conference report. The bill proscribed the pollution of all waters in the country, not just the navigable streams over which Parliament had jurisdiction under the *British North America Act*. It banned the release of raw sewage as well as poisonous, noxious and colour-altering industrial effluents and mine tailings. All persons, corporations and governments found contravening these pollution prevention measures would be liable for both initial fines and cumulative sanctions for every day after which the offence continued.³⁵

The Senate and House of Commons each produced a member who championed the pollution control legislation. Once again the Senate advocate was Napoleon Belcourt, the Ottawa senator whose 1910 proposal had helped prompt the public health conference. In 1911 he enthusiastically introduced the legislation provided by the conference's water pollution committee and staunchly defended it in the Senate until it finally passed and went to the House of Commons in 1912. Belcourt's Commons counterpart was Selkirk MP George Bradbury. Bradbury's initial concern had been for the deplorable condition of the Red River in his home constituency north of Winnipeg, but he soon embraced the larger national pollution problem. He first introduced legislation which the House of Commons debated along with the Senate bill in 1912 and re-introduced it in each of the following three sessions.

The debate over the *Pollution of Navigable Waters* bill followed similar lines in both houses over the next four years. Opponents of the legislation believed it was expensive and impracticable.³⁶ Some argued that pollution abatement measures would unduly restrict the growth of smaller, inland communities if Parliament curtailed their ability to pollute at will, and the impact might well be national in scope. Canada, it was suggested, was not yet at the stage where it could afford to consider such legislation. Besides, as Montreal senator Henry Cloran argued, Canada had "rivers and lakes large enough to contain all the refuse that the inhabitants of the country could discharge into them, without danger of contagion to the people."³⁷ Clearly the focal problem was not pollution itself but the impact it had upon human health and some legislators would deny that in favour of economic gains.

Another group of opponents represented the interests of maritime communities which discharged their sewage into tidal salt water. In their view uniformly applied national legislation would place an unfair burden on these municipalities if they were forced

unnecessarily to treat sewage being released into water that could not be used to provide drinking water.³⁸ Other legislators believed that such sweeping legislation was *ultra vires* for the federal Parliament.³⁹

In rebuttal, proponents argued that the proposed legislation fell within federal purview under the residual power of the *British North America Act*. Furthermore, provincial governments were clearly unable to manage the problem in bodies of water entirely within their borders, let alone in interprovincial or international ones. As Belcourt argued, "if we are going to split hairs and allow the community to die by hundreds and thousands from preventable diseases such as typhoid fever, simply because of the question of jurisdiction...it is about time the community should know it and urge parliament to provide some remedy."⁴⁰ Among those who supported this opinion were the Minister of Marine and Fisheries, John D. Hazen, and Minister of Agriculture, Martin Burrell. Both ministers' portfolios gave them particular interest in pollution abatement legislation — Hazen for the obvious benefit to fisheries that such a measure would provide, and Burrell because his department housed the federal public health service.⁴¹ As for those who argued the *Pollution of Navigable Waters* bill was impracticable, Belcourt and Bradbury pointed out that the problems of how and where to implement the legislation could easily be addressed by the people who made the regulations.⁴²

Despite strong arguments in the bill's favour and significant investigation in select committee, proponents of the legislation were unable to override opposition. When Bradbury again introduced the bill to the Commons in 1915, Hazen, formerly its staunch supporter, now urged that nothing be done until the International Joint Commission published its report on boundary waters pollution, expected imminently. He had heard that the report would "be of a very drastic character" and he did not want Parliament to pass conflicting legislation.⁴³ Thomas Chase Casgrain, Postmaster General and until recently chairman of the IJC's Canadian Section, echoed Hazen's concern asserting that legislation passed prior to the Commission's report would be a "breach of faith."⁴⁴

The ministers' speeches signalled a sea-change for the government. Regional and municipal opposition had grown so strong over the previous year that it was not politically astute to pass the legislation at that time. In fact maritime municipalities met during the summer of 1915 to demonstrate their opposition to the legisla-

tion and to lobby their MPs to vote against it. Approaching the end of his first mandate, Prime Minister Borden was anxious to avoid contentious issues which might raise speculation about an imminent election.⁴⁵ Instead, the government took refuge behind the IJC's pollution investigation and delayed a decision on legislation until the Commission reported.

By 1915 no real answer to the question of responsibility for water pollution control had yet been reached. Although the Ontario government had gained a significant advantage in its fight against reluctant municipal governments with the amended and consolidated *Public Health Act* in 1912, local politicians still believed their obligation did not extend beyond the immediate community. Their strong preference for water treatment over sewage purification meant that raw sewage continued to pour into the province's rivers and lakes. Strong municipal lobbying against the *Pollution of Navigable Waters* bill, especially from the Maritimes, curtailed federal efforts to halt pollution in 1915.

As the House of Commons decided to set aside the *Pollution of Navigable Waters* bill, the International Joint Commission was pursuing a Great Lakes water pollution investigation that had begun in 1912.⁴⁶ On 1 August that year, the two federal governments invoked the Commission's investigatory function and asked it to determine the extent, causes and location of pollution in boundary waters which extended to and affected the other side in contravention of Article 4 of the 1909 Boundary Waters Treaty. They asked the IJC to recommend remedial measures to return the water to a sanitary condition suitable for domestic use while protecting all interests on both sides of the boundary.⁴⁷

The subsequent study was the largest bacteriological investigation undertaken anywhere in the world to that point.⁴⁸ Upon the advice of a number of prominent sanitary engineers and public health professionals, the Commission focused on the Great Lakes Basin and tested water samples from 1,447 points between Rainy River in the west and Cornwall in the east during the summer of 1913. The tests determined the total amount of organic material, both faecal and decaying vegetable matter, in the water. They calculated the amount of bacteria able to thrive at human body temperature. They established the quantity of the human colon bacillus (*B. coli*) in the water. This latter test was the most specific indicator of the presence of human faecal matter and, therefore, sewage pollution in the water.⁴⁹ Based upon these tests, the scientists devised a five-level scale rating surface water quality. This

enabled them to determine where pollution crossed the border so they could formulate remedial plans for those areas.

As part of their exercise in determining remedial measures, the Commission consulted a number of Canadian and American sanitary engineers. They established clear guidelines for raw water quality, suggested a basic sewage treatment regime and offered their opinion on ways to manage water supply and sewage treatment for lake vessels.⁵⁰ IJC also held public meetings in September, October and November 1914, and again in June and August 1916, to determine municipal support for water purification and sewage treatment. The Commission wished to ascertain the level of commitment communities were both capable and willing to assume before making its final recommendations to the two governments.⁵¹

The International Joint Commission presented its final report on boundary water pollution in September 1918. The document represented the distillation of five years' investigation, a vast amount of accumulated scientific data, detailed reports from advisory engineers, and hours of testimony presented at public hearings. It outlined the sources and extent of existing pollution between Rainy River and the St. Lawrence River and offered the Commission's carefully considered recommendations for remedial measures. According to the IJC's findings, the main bodies of the Great Lakes, apart from polluted shores, the areas around the mouths of rivers, and shipping lanes, were "in a state of almost absolute purity," but that these other areas were another story altogether.⁵² The connecting channels of the Great Lakes, especially in the vicinity of lake and riverside communities, were heavily polluted by raw sewage from both cities and lake vessels. These areas, "besides being in places unsightly, malodorous, and absolutely unfit for domestic purposes" posed a considerable danger to the health of anyone coming into contact with the water. Municipal directives frequently closed these areas to bathers.⁵³

The condition of the Detroit River and the Niagara River directly contravened the treaty. The city of Detroit released the untreated sewage of 850,000 people directly into the Detroit River. At Amherstburg, a Canadian town downstream from Detroit, the *B. coli* count reached the incredible figure of 10,392 per 100 cc. of water, rendering it unfit for domestic use. The IJC concluded: "Beyond question the pollution from Detroit and the towns lower down the river crosses the boundary line and affects detrimentally health and property on the other side."⁵⁴

On the Niagara River, Buffalo added raw sewage of another 500,000 people to the water. At the IJC hearings, a resident of North Tonawanda, just downstream from Buffalo's sewer outlet, recounted how at a recent meeting of the area's "pure water conference" someone had tied a napkin over a tap and let the water run for twenty minutes, after which "the stench of the accumulated excreta on that napkin was so strong that you did not want it anywhere near your nose." The water of the Niagara River "is not fit to be seen or used, much less drunk,"⁵⁵ Below the Falls, the churning action of the whirlpool mixed sewage pollution throughout the water, grossly contaminating the entire river and a radius of eighteen miles into Lake Ontario.⁵⁶

While the St. Marys, St. Clair and St. Lawrence rivers were not as badly polluted as the other two, they were in a state which defied the spirit of the treaty and, if they continued to deteriorate, would certainly break it. This situation existed, the IJC asserted, because of the indifference of riparian communities to the danger presented by their raw waste and what the Commission called their "ill-directed spirit of economy" which made community leaders reluctant to assume the financial burden of remedial measures. The result was a situation "generally chaotic, everywhere perilous, and in some cases disgraceful."⁵⁷

The commissioners felt obliged to point out that the terms of the reference from the two federal governments had been unduly restrictive, forcing them to make less stringent recommendations than they wished. For example, because of the enthusiastic exercise of treaty rights to "free and open" navigation of boundary waters, the basin's population could and did contract diseases while across the border and carried them back to their own side. Similarly, lake going vessels were responsible for a significant amount of pollution, and, while they might not violate the letter of the treaty when they released polluted ballast water or raw sewage after crossing the boundary line, they did contravene its spirit. In neither case did pollution from one side actually cross the border in the water. Nonetheless, the results were the same and the situations which precipitated them should be addressed.⁵⁸ There was also the case of communities which, by virtue of geography, were far enough away from the boundary that their pollution did not actually cross it. Nevertheless, they released as much volume of raw sewage as other communities located closer to the border and caused equal damage to ambient water quality. The commissioners believed that all communities polluting boundary waters should be held equally

accountable for their situation regardless of the limitations imposed by the reference.⁵⁹ Despite their wish to interpret the treaty and pollution reference more broadly and incorporate situations such as these, the commissioners refrained from stepping beyond the limits set for them by the two governments.

The Commission concluded that remedy for the pollution situation was both "feasible and practicable," as well as affordable for all border municipalities. For urban offenders, the IJC recommended that sewerage works collect and treat sanitary wastes before releasing them into boundary waters. Vessel sewage would be best handled if chemically neutralized before emptying, and ballast water should be similarly treated. Garbage and sawmill waste now being discharged into boundary waters should be prohibited and industrial waste should be treated as well.⁶⁰

Finally, the IJC turned to the questions which had been plaguing the provincial and federal governments since early in the century. Who was responsible for managing water pollution and how would it be accomplished? The current situation did not exist because of deliberate ignorance of treaty obligations, but because municipal governments on both sides of the border failed to acknowledge the extent of their role in polluting boundary waters. While local governments had been relatively successful in providing water and sewerage collection facilities for the communities under their care, the general lack of sewage treatment forced downstream communities to shoulder increasingly heavy burdens in their effort to provide safe drinking water. Ideally, all towns should adequately treat their sewage before release to avoid overtaxing other communities' water filtration systems.⁶¹

In order to achieve uniform treatment standards, the IJC believed that a single organisation should be assigned jurisdiction over all boundary waters with the power to set effluent quality standards. This seemed to be the best answer given municipal politicians' concern about the cost of new installations and their indifference to the danger created by sewage pollution, as well as provincial and federal inability or unwillingness to provide effective control of the situation. The authority would leave the installation of remedial works and their financing up to individual communities, but would establish the capacity and degree of efficiency for sewage purification facilities. Given the international importance of the situation, and the number of existing bodies which could claim some jurisdiction over boundary waters, it was clear that the authority should be jointly created by the two federal

governments. The International Joint Commission recommended that it be given the new task since it already had jurisdiction over the use and diversion of boundary waters. To ensure it had enough authority to carry out the assignment, the Commission also asked for the power to create rules and regulations, give orders and directions as it saw fit, as well as to employ the engineers and other experts it deemed necessary.⁶²

In March 1919 the two governments asked the IJC to draft a convention or concurrent legislation to confer the "necessary authority to remedy the existing conditions of pollution" identified in the final report. In the commissioners' opinion, the draft they finally produced met that charge but they warned the governments that the powers were "not sufficiently wide...to fully and adequately remedy all the objectionable conditions" that existed in the boundary waters. Once again the IJC reiterated its argument for a broader reading of the 1909 treaty. Where gross pollution existed on one side of the boundary it did not, in the Commission's opinion, actually have to cross the boundary and affect the water on the other side to injure health and property. Yet under the wording of the governments' request and the subsequent convention, such instances would be beyond the Commission's scope. The commissioners were also worried that the convention did not include preventative measures. They would not be able to address a pollution problem until it had actually contravened the treaty. In their view it was neither efficient nor effective to wait until pollution had crossed the boundary before initiating remedial measures. In its 1920 letter of transmittal the IJC urged the governments to reconsider the scope of the request and give the Commission the necessary power to "maintain boundary waters in as healthful a condition as practicable."⁶³

After a few minor changes to the draft, the Canadian government was prepared to accept the convention. The American government was more concerned about the possibility of concluding an agreement which was too closely linked to the Boundary Waters Treaty and in 1926 presented the Canadians with an alternative draft independent of the 1909 treaty.⁶⁴ Because the new draft involved several Canadian departments, including Marine, Interior, and Health, it was circulated among them to obtain their opinion. By March 1928 none of the affected federal departments, the International Joint Commission, nor the Oil Pollution Committee had taken further action on the draft. Prodded again by External Affairs, both Marine and Interior replied within days that

they had no objections to the convention and the Department of Health followed suit at the end of April. By May the Canadian section of the IJC had also been queried and replied that it had nothing further to add to the draft. Communication regarding the convention then lapsed until 25 October 1929, when the Canadian ambassador to Washington, Vincent Massey, again informed External Affairs that the Americans wanted to know if there had been any further developments on the draft.⁶⁵ Four days later the New York and Toronto stock markets crashed and the two federal governments became preoccupied with the financial panic and subsequent Great Depression to the exclusion of less pressing public policy issues, including boundary waters pollution.

While the Depression provides a reasonable explanation for why the convention did not proceed after 1929, a better question is why it took so long for anything to be done before that date. Neither contemporary memoranda nor briefing notes from the 1940s, when the convention was resurrected, indicate why either government took so long to respond to the various drafts. However, it is apparent that just as unacceptably high typhoid mortality levels had initially spurred the provincial and federal governments to action, the decline in general and epidemic outbreaks of the disease equally reduced the demand for a legislative or diplomatic solution. The IJC itself noted that there had been a marked decline in typhoid mortality between its first bacteriological investigation in 1913 and the release of its final report in 1918.⁶⁶ Commission attributed these statistics to the rapid and comprehensive introduction of chlorine treated water. Sanitary engineers advocated this process because of its effectiveness, efficiency and relatively low cost at making bacteria contaminated water safe for domestic use.

By the time the two federal governments began to consider the convention, most Canadian and American communities of any size located along the boundary waters had installed a chlorine apparatus of some type or were under government order to do so. In 1927 Ontario's Director of Sanitary Engineering, A.E. Berry, reported that there were 140 chlorinating plants in operation in the province, representing 52% of all municipalities or 76% of the total Ontario municipal water supply. The installation of chlorination systems was accompanied by a concerted extension of municipal water services to hitherto unreached portions of most communities. This combination resulted in 20% fewer cases of typhoid than the average for the period between 1920 and 1926. Most of those cases had either been contracted while the victim vacationed where milk and

water were not properly protected, or through food or milk handled by a typhoid carrier. Communities rarely experienced typhoid fever in epidemic proportions after 1920 and if they occurred the cause was either a chlorination plant which was not working properly or contaminated milk.⁶⁷

Despite the new powers conferred upon the Ontario Board of Health under the 1912 *Public Health Act*, municipal officials remained reluctant to construct sewage treatment facilities in their communities. In the interest of maintaining amicable provincial-municipal relations and as an indication of how entrenched local power remained, provincial health officials did not use the fullest extent of their authority to push this solution. Instead District Officers of Health condemned bad water supplies, ordered them to be boiled or, more often, supervised the installation of chlorinating plants. Therefore public health officials' success in curbing water borne disease came primarily from the inroads made in protecting the public water supply. Chlorinating municipal water prevented the outbreaks of typhoid fever in the epidemic proportion which had plagued Ontario cities at the turn of the century. By 1920 chlorine was the great panacea providing protection for the health of increasing numbers of Ontarians.

As for aborted action at the federal and international levels, chlorine's effectiveness at preventing the spread of typhoid fever and other water borne disease provided an uncontentious, politically palatable way to avoid both proposed national legislation and a further binational convention. With maritime communities staunchly opposed to the federal *Pollution of Navigable Waters* bill and municipal politicians loath to spend money on expensive sewage treatment processes, chlorine was the easiest solution all around. It was cost effective, produced immediate results and sanitary engineers strongly advocated its use. Sadly, as the health of the people of Ontario steadily improved, just as steadily the health of its rivers and lakes declined.

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NOTES

- 1 Canada. Commission of Conservation. "Dominion Public Health Conference," *Second Annual Report including A Report of the Proceedings of the Second Annual Meeting held at Quebec, January 17-20, 1911 and of the Dominion Public Health Conference held at Ottawa, October 12-13, 1910* (Montreal: John Lovell & Son, Limited, 1911), 131.
- 2 Mary Powell, "Provincial-Local Relations in Ontario: The Case of Public Health, 1882-1984," (PhD thesis, University of Toronto, 1991) specifically examines the professionalization of local boards of health. See also David Cameron, *Schools for Ontario* (Toronto: University of Toronto Press, 1972); David Siegal, "Provincial-Local Municipal Relations in Ontario: A Case Study of Roads," (PhD thesis, University of Toronto, 1982); and Richard Loreto, "Reorganizing Municipal Police Forces in Ontario: Convergence of Function and Local Reform Interest," (PhD thesis, University of Toronto, 1984).
- 3 In 1910 the US recorded 46 deaths per one hundred thousand persons. J.W.S. McCullough, "Purification and Treatment of Water Supplies," *The Municipal World* XXIV (October 1914), 241.
- 4 International Joint Commission, *Final Report of the International Joint Commission on the Pollution of Boundary Waters Reference*. (Ottawa-Washington, DC: Government Printing Office, 1918), 7. Here after *Final Report, 1918*.
- 5 IJC. *Final Report, 1918*, 7.
- 6 John Hagopian, "The Political Geography of Water Provision in Paris, Ontario, 1882-1924," *Urban History Review* XXII (November 1994): 32-51. Hagopian argues that the unfair distribution of water was effected through municipal voting laws which gave property owners disproportionate power, a pattern repeated across the province because municipal voting was provincially legislated.
- 7 J.W.S. McCullough, "Purification and Treatment of Water Supplies," 241.
- 8 Relatively little has been written on the provincial Board of Health to date. The most comprehensive examination of local-central tension is Mary Powell, "Provincial-local Relations in Ontario: The Case of Public Health, 1882-1984," (PhD thesis, University of Toronto, 1991). Of the province's local governments Toronto provided the strongest early leadership in public health reform, see Heather MacDougall, "The Genesis of Public Health Reform in Toronto 1869-1890," *Urban History Review* 10(3) 1982 and MacDougall, "Public Health and the 'Sanitary Idea' in Toronto 1866-1888," *Essays in the History of Canadian Medicine*, (ed) Wendy Mitchinson and Janice Dicken McGinnis, (Toronto: McClelland and Stewart, 1988) and MacDougall, *Activists and Advocates: Toronto's Health Department, 1883-1983* (Toronto: Dundurn Press Ltd., 1990).

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- 9 Bryce was born in Mount Pleasant, Ontario in 1853 and educated at Upper Canada College and the University of Toronto before he went to Edinburgh and Paris to pursue further medical studies in 1880. He returned to Ontario in the late 1870s and became the provincial health officer in 1882. In 1903 he entered federal service as chief medical officer in the immigration branch. Henry James Morgan (ed), *Canadian Men and Women of the Time: A Handbook of Canadian Biography of Living Characters* (2nd edition) (Toronto: W. Briggs, 1912), 122-123. See also *An Act to establish a Provincial Board of Health and to give increased powers to Local Boards of Health*, 45 Victoria, c. 29.
- 10 Ontario. *The Public Health Act of 1884*, 47 Victoria, c.38. Also "1910-1920: A Review of Ten Years' Progress," *Thirty-ninth Annual Report of the Provincial Board of Health of Ontario, Canada for the Year 1920* (Toronto: King's Printer, 1921) 23-24. Unfortunately the surviving records of the provincial Board of Health are sketchy and consist primarily of individual municipality records until the post Second World War period.
- 11 Peter Bryce, "Measures for the Improvements and Maintenance of the Public Health," in Canada. Commission of Conservation. *Report of the First Annual Meeting held at Ottawa January 18th to 21st, 1910* (Ottawa: The Mortimer Co., Ltd., 1910), 123.
- 12 Ontario. *Sessional Papers*, 1907, no.36, "The Sanitary Journal of the Provincial Board of Health of Ontario Being the Twenty-fifth Annual Report for the Year 1906," 8-9.
- 13 Commission of Conservation, "Dominion Public Health Conference," 169.
- 14 Charles Hodgetts, "The Importance of Public Health from a National Standpoint," *The Public Health Journal of Canada* (September 1910), 430. See also J.W.S. McCullough, "The Public Health Act, 1912," 192 for similar comments from a later provincial secretary.
- 15 For example, in 1907 municipal revolt forced the provincial government to withdraw compulsory minimum wages for rural public school teachers. Editorial, *The Municipal World* XVII (February 1907), 26.
- 16 "Sewage Treatment," *The Municipal World* XVIII (February 1908), 33.
- 17 John D. Watson, "The Sewage Disposal Question," *The Municipal World* XXI (September 1911), 206.
- 18 Joel A. Tarr, James McCurley and Terry F. Yosie, "The Development and Impact of Urban Wastewater Technology: Changing Concepts of Water

- Quality Control, 1850–1930," 73 also generally, Stuart Galishoff, "Triumph and Failure: The American Response to the Urban Water Supply Problem, 1860-1923," 35-57 both in Martin Melosi (ed), *Pollution and Reform in American Cities, 1870–1930* (Austin: University of Texas Press, 1980). See also Joel A. Tarr, Terry Yosie and James McCurley, "Disputes Over Water Quality Policy: Professional Cultures in Conflict, 1900-1917," *American Journal of Public Health* 70 (April 1980):427–435.
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 - 20 Ontario. Provincial Board of Health. "Quarterly Reports of the Secretary," in *Annual Reports* through the period, especially 1905–1913. Also International Joint Commission, *Hearings in re. Remedies for the Pollution of Boundary Waters Between the United States and Canada* (Washington: Government Printing Office, 1915), 220.
 - 21 *Saturday Night*, 15 June 1912, 2. Also, "The Sanitary Journal of the Provincial Board of Health, 1906," 160; and J.W.S. McCullough, "The Public Health Act, 1912," 179.
 - 22 Senate. *Debates*, 2 March 1910, 335–353 and 3 March 1910, 366–371.
 - 23 Senate. *Debates*, 3 March 1910, 366–368. See also Senate. *Journals of the Senate of Canada* (XLIV 1909), 72. Parliament created the Commission of Conservation in 1909 after federal representatives attended the North American Conservation Conference hosted by US President Theodore Roosevelt and his Chief Forester, Gifford Pinchot. The Canadian delegation, including former Minister of the Interior, Clifford Sifton, MP Henri Béland and Minister of Agriculture Sidney Fisher, recommended the government create a body of federal, provincial and academic experts in conservation. The Commission had investigatory and advisory functions only but assiduously pursued conservation efforts throughout its mandate, 1909–1921. There are several fine articles on various aspects of the Commission's work but the most comprehensive investigation to date is Michel Girard, *L'écologisme retrouvé: Essor et déclin de la Commission de la conservation du Canada* (Ottawa: Les presses de l'Université d'Ottawa, 1994).
 - 24 Commission of Conservation, "Dominion Public Health Conference," 118–119.
 - 25 Commission of Conservation, "Dominion Public Health Conference," 119–120, 131.
 - 26 Commission of Conservation, "Dominion Public Health Conference," 118–153.
 - 27 Commission of Conservation, "Dominion Public Health Conference," 166–170. Also Canada. House of Commons. *Proceedings and Evidence Select Committees on the Pollution of Navigable Waters (Appointed during the Session of 1913, 1914, and 1915)*, (Ottawa: King's Printer, 1915) 66. (Hereafter *Select Committees on the Pollution of Navigable Waters*.)

- 28 Commission of Conservation, "Dominion Public Health Conference," 217–219.
- 29 *The Globe*, 14 October 1910.
- 30 Ontario. Legislative Assembly. *The Public Health Act, 1912*, 2 George V, c.58, Sections 94–97.
- 31 Dr. John McCullough, "The Public Health Act, 1912," *The Municipal World* XXII (August 1912), 179. Also Ontario. Legislative Assembly. *Newspaper Hansard*, 22 March and 11 April 1912.
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- 33 "Select Committees on Pollution of Boundary Waters," 152.
- 34 The Act increased provincial involvement in municipal water and sewerage systems so much that it hired a full time sanitary engineer in 1912 and created a division of Sanitary Engineering in 1920. The Division grew from two engineers and a chemist in 1920 to eight people in 1926, six of whom were engineers. Ontario. Board of Health. *Thirty-ninth Annual Report of the Board of Health Ontario, Canada for the year 1920* (Toronto: King's Printer, 1921) and Department of Health, *Forty-fifth Annual Report of the Department of Health Ontario, Canada for the year 1926* (Toronto: King's Printer, 1927).
- 35 Commission of Conservation, "Dominion Public Health Conference," 167–168 also *Select Committees on Pollution of Navigable Waters*, 173.
- 36 Senate. *Debates*, 29 November 1911, 53–54 and 1 December 1911, 65–66. Also House of Commons. *Debates*, 25 April 1913, 8636–8637.
- 37 Senate. *Debates*, 13 February 1912, 205. Also House of Commons, *Debates*, 25 April 1913, 8621–8626 and 12 February 1915, 123.
- 38 Senate. *Debates*, 29 November 1911, 53–54 and 1 December 1911, 65–66. Also *Select Committees on the Pollution of Navigable Waters*, 46–48, 139–140 and 162–171 and House of Commons. *Debates*, 12 February 1915, 118.
- 39 Senate. *Debates*, 10 February 1911, 202 and 16 March 1911, 373. Also House of Commons, *Debates*, 25 April 1913, 8636–8637.
- 40 Senate. *Debates*, 10 February 1911, 203. See also House of Commons, *Debates* 25 April 1913, 8616.
- 41 House of Commons. *Debates*, 25 April 1913, 8621–8627 and 8632.
- 42 Senate. *Debates*, 10 February 1911, 204, 8 February 1912, 195–196 and 13 February 1912, 201 and 209. Also House of Commons. *Journals of the House of Commons* (1915) Appendix I, "Select Committees on Pollution of Navigable Waters," 162–171.
- 43 House of Commons. *Debates*, 12 February 1915, 122.

- 44 House of Commons. *Debates*, 12 February 1915, 126.
- 45 "Select Committees on Pollution of Navigable Waters," 162–171. On Borden see R. Craig Brown, *Robert Laird Borden, A Biography*, vol. II: 1914–1937 (Toronto: Macmillan of Canada, 1980), 36–37.
- 46 The Commission was created under the 1909 Boundary Waters Treaty between the United States and the United Kingdom, which signed on behalf of Canada. It consisted of six members, three appointed by the Canadian government and three by the American government. Under the treaty the IJC's duties were judicial, investigatory and arbitrational. Articles 8, 9 and 10, *Treaty between the United Kingdom and the United States of America Relating to boundary waters and questions arising along the boundary between Canada and the United States* in Robert Spencer, John Kirton and Kim Richard Nossal (eds), *The International Joint Commission Seventy Years On* (Toronto: Centre for International Studies, 1981), 133–140.
- 47 International Joint Commission. *Progress Report of the International Joint Commission on the Reference by the United States and Canada in Re The Pollution of Boundary Waters: Whether or not such pollution extends across the boundary in contravention of the Treaty of January 11, 1909, and if so, in what manner or by what means it is possible to prevent the same, Including Reports of the Sanitary Experts* (16 January 1914), 2. Hereafter *IJC Progress Report, 1914*.
- 48 Mary Durfee and Susan T. Bagley, "Bacteriology and Diplomacy in the Great Lakes, 1912–1920," paper presented at the 1997 biennial meeting of the American Society for Environmental History, Baltimore, MD, 6–9 March 1997. The two examine the first pollution reference from the American side of the border asking why the study has so completely faded from the scientific literature.
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- 50 International Joint Commission. *Pollution of Boundary Waters: Report of the Consulting Engineers Upon Remedial Measures, 8 March 1916* (Washington: Government Printing Office, 1918), 13.
- 51 International Joint Commission. *Hearings of the International Joint Commission in re. Remedies for the Pollution of Boundary Waters Between the United States and Canada Held at Niagara Falls, Ontario, Buffalo, N.Y., Detroit, Michigan, Windsor, Ontario, September 25 to October 2, Inclusive, Detroit Michigan, November 10 and 11, and Washington, D.C., December 14 and 16, 1914* (Washington: Government Printing Office, 1915) and IJC. *Hearings of the International Joint Commission in re. Remedies for the Pollution of Boundary Waters Between the United States and Canada Being Public Hearings Held at Buffalo, N.Y., and Detroit, Michigan, June 21–27, 1916, and Ogdensburg, N.Y., August 25, 1916* (Washington: Government Printing Office, 1917).
- 52 IJC. *Final Report, 1918*, 51.
- 53 IJC. *Final Report, 1918*, 51.
- 54 IJC. *Final Report, 1918*, 25.
- 55 IJC. *Hearings...in Re: Remedies for the Pollution of Boundary Waters Between the United States and Canada*, (1915) 59.

- 56 IJC. *Final Report, 1918*, 26.
- 57 IJC. *Final Report, 1918*, 31.
- 58 IJC. *Final Report, 1918*, 28, 51–52.
- 59 National Archives of Canada (NAC). RG 25. Department of External Affairs, vol.1144, file 897, CA Magrath, "Memorandum re Pollution Investigation," 24 November 1914, 1. Also NAC. RG 89. Water Resources Branch, ACC 1988-89/059, box 27, file 7858-1, vol. 1, L.J. Burpee, "Memorandum for Mr. Magrath," no date, 4. The guarantee of free and open navigation is in Article I of the Boundary Waters Treaty.
- 60 IJC. *Final Report, 1918*, 52.
- 61 IJC. *Final Report, 1918*, 48–49.
- 62 IJC. *Final Report, 1918*, 48–50.
- 63 International Joint Commission. Library and Archives (Ottawa), Pollution of Boundary Waters Docket 4-3-1:1, IJC to the Secretary of State for External Affairs and the Secretary of State, 6 October 1920, 1–5.
- 64 IJC. Docket 4-3-1:1, Frank B. Kellogg to His Majesty's Ambassador at Washington, 8 February 1926.
- 65 NAC. RG 25. Department of External Affairs, vol. 2644, file pocket 2871-40C, TM Patterson, "Chronological Review of Negotiations re. Proposed Convention between Canada and the United States with respect to the Pollution of Boundary Waters and Waters Flowing Across the Boundary from August 1, 1912 to October 25, 1929," 1 October 1937, 8–12.
- 66 IJC. *Final Report, 1918*, 24.
- 67 Ontario. Board of Health, *Forty-fifth Annual Report of the Department of Health Ontario, Canada for the year 1926* (Toronto: King's Printer, 1927), 14 and Department of Health, *Third Annual Report of the Department of Health Ontario, Canada for the Year 1927* (Ontario: King's Printer, 1928), 44. See District Officers of Health reports in Board of Health, *Annual Reports* beginning in 1920 where doctors begin remarking about declining incidence of typhoid and the reasons for episodic outbreaks.

BIOGRAPHICAL NOTE

Jennifer Read is a research associate at the Great Lakes Institute for Environmental Research, University of Windsor. Her interests focus on the evolution of Great Lakes institutions and resource management policy.