



# Canada Beach Report 2017 First Edition

Swim Drink Fish Canada

**Published by Swim Drink Fish Canada.**

Swim Drink Fish Canada is a Canadian charity, founded in 2001 under the name “Lake Ontario Waterkeeper”. The organization represents a network for 1.5-million people working for swimmable, drinkable, fishable water. Swim Drink Fish Canada’s mission is to create a nation of water leaders, people who are connected to their waterbodies, connected to each other, and active in community life. By protecting water, we believe we can protect the things that are most important in life: family, culture, health, and prosperity.

Swim Guide is a beach information service created by Swim Drink Fish Canada. Swim Guide started on Lake Ontario and has since expanded to describe beach information, water quality history, and water quality monitoring practices in every province in Canada. Since 2011, “Swim Guide” beach information website and app have been the most comprehensive beach water quality service in Canada.

With over 1 million all-time users, Swim Guide offers water quality alerts, beach descriptions, photos, and directions for 7,000 beaches in Canada, the U.S.A., as well as Baja Mexico, and New Zealand. In 2017 Swim Guide launched in the Bahamas. Swim Guide is available in English, French. The Swim Guide iOS app is available in English, French, and Spanish.

**The Canada Beach Report is available on Swim Guide at the following address:**

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## Acronyms and Abbreviations

Acute febrile respiratory illness	AFRI
Alberta Health Services	AHS
American National Technical Advisory Committee's	NTAC
Canada-Newfoundland and Labrador Water Quality Monitoring Agreement	WQMA
Canadian Environmental Assessment Act	CEAA
Centres for Disease Control and Prevention	CDC
Combined sewer overflow	CSO
Department of Environment and Local Government	DELG
Environmental Health Officer	EHO
Environmental Protection Agency	EPA
Federal-Provincial-Territorial Working Group on Recreational Water Quality	FPT Working Group / Working Group
First Nations and Inuit Health Branch	FNIHB
First Nations Health Authority	FNHA
Gastrointestinal Illnesses	GI
Guidelines for Canadian Recreational Water Quality	Guidelines
Halifax Regional Municipality	HRM
Health Protection and Promotion Act	HPPA
Institut National de Santé Publique du Québec	INSPQ
Ministry of the Environment and Climate Change	MOECC
Ministry of Health and Social Services / Ministère de la Santé et des services sociaux	MSSS
Ministry of Natural Resources	MNR
New Brunswick Department of Environment and Local Government	DELG
Nova Scotia Lifeguard Society	NSLS
Ontario Public Health Standards	OPHS
Provincial Water Quality Objectives	PWQO

The Ministry of Sustainable Development, Environment, and Action Against  
Climate Change / Ministère du développement durable, de l'environnement,  
et de la lutte contre les changements climatiques

MDDELCC

World Health Organization

WHO

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## Executive Summary

*Canadians everywhere understand the importance of clean, safe recreational bathing waters. Whether they are used for sport or relaxation, health or pleasure, there is something about the enjoyment and sense of well-being derived from the experience that cannot easily be matched.<sup>1</sup>*

The Canada Beach Report is the first report of its kind. It provides Swim Guide, and others in our field, with an understanding of the landscape of beach water quality rules, monitoring practices, and reporting across Canada.

The Canada Beach Report will answer these questions for Canadians: Does recreational water quality information exist for the beaches where I swim? Is this information reliable? Is it easily accessible? Is my water swimmable? Is there sufficient information and effective communication about the quality of the water to allow me to protect myself from contact with contaminated recreational water?

We believe 100% of Canadian households should have access to basic data about the swimmability of their watersheds. Access to clean, swimmable beaches and the exercise, enjoyment, and relaxation these recreational water environments provide is integral to health, well-being, and the quality of life people in Canada value.

People living in Canada have an undeniable connection to water. Bordered by three oceans and dotted with tens of thousands of lakes, rivers, and streams, some of the most unique and beautiful coastal and inland beaches on the planet are found here.

Water is part of us and has made us who we are. Water is our heritage, our culture. Canadians overwhelmingly value fresh water as our most precious resource.<sup>2</sup> Over half of Canadians feel very strongly that water is part of our national identity, according to the 2017 Royal Bank of Canada Canadian Water Attitudes Study.<sup>3</sup> Canada has more coastline than any other country in the world.

People are increasingly engaging in recreational water activities, more frequently, and for longer

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<sup>1</sup> Canada, “Environmental & Workplace Health, Water Quality: Recreational Water,” Health Canada, <http://www.hc-sc.gc.ca/ewh-semt/water-eau/recreat/index-eng.php> (accessed 30 May 2017).

<sup>2</sup> Royal Bank of Canada, *2017 RBC Canadian Water Attitudes Study*. RBC Community & Sustainability, Toronto, March 2017, Accessed 9 April 2017. 4.

<sup>3</sup> Royal Bank of Canada, *2017 RBC Canadian Water Attitudes Study*. RBC Community & Sustainability, Toronto, March 2017, Accessed 9 April 2017. 4. [http://www.rbc.com/community-sustainability/\\_assets-custom/pdf/CWAS-2017-report.pdf](http://www.rbc.com/community-sustainability/_assets-custom/pdf/CWAS-2017-report.pdf).

periods of time.<sup>4</sup> More and more people are enjoying the country's waterways year round, outside of Canada's short summer months.

Along with the substantial benefits of Canada's rich water resources come potential health hazards. Various sources of contamination expose recreational water users to waterborne pathogens and recreational water illnesses. In Canada, sewage and stormwater are the leading contributors to water pollution.<sup>5</sup> Over 200 billion litres of untreated sewage are dumped in our waterways every year.<sup>6</sup> Sources of sewage pollution include sewage discharges from waste treatment plants, combined sewer overflows (CSOs), septic malfunctions, and stormwater.

With climate change, health risks are on the rise for recreational water users; increased precipitation, stormwater outflow, and runoff lead to increased concentrations of contaminants and pathogens in surface water. Drought can have the same effect, concentrating contaminants and pathogens. From a recreational water user's perspective, effective and frequent water quality monitoring and public notification of water contamination and test results are more important than ever.

Beach water quality assessment and monitoring practices differ widely across the country. Communication There are no federal standards for recreational water quality. Rather, Health Canada recommends guidelines for the management of recreational water. Recreational water management falls to the jurisdiction of provinces and territories.

Recreational water quality standards vary across provinces and territories, and even within provinces and territories, according to the practices of the monitoring agencies assigned. While many provinces use a variation of the federal guidelines as their standards, some provinces do not have regular monitoring or sampling programs for recreational water quality. Within certain provinces, different agencies use different monitoring guidelines and practices—even in the same watershed. Vast areas of certain provinces are completely unmonitored for recreational water

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<sup>4</sup> Kathy Pond, *Water recreation and disease. Plausibility of Associated Infections: Acute Effects, Sequelae and Mortality* (Geneva, World Health Organization, 2005), viii.

<sup>5</sup> Municipal wastewater is one of the largest sources of pollution, by volume, to surface water in Canada. Treated wastewater may contain grit, debris, disease-causing bacteria, biological wastes, nutrients, and chemicals with the potential to damage human and environmental health. The higher the level of treatment provided by a wastewater management system, the cleaner the effluent and the less the impact on the environment. Canada. "Data Sources and Methods for the Municipal Wastewater Treatment Indicators," Environment & Climate Change Canada, <http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=48190375-1&offset=2&toc=show> (accessed February 2017).

<sup>6</sup> Elizabeth Tompson, "Billions of litres of raw sewage, untreated waste water pouring into Canadian waterways." *CBC*, December 23 2016, (Accessed January 2017), <http://www.cbc.ca/news/politics/sewage-pollution-wastewater-cities-1.3889072>

quality.

The Canada Beach Report focuses exclusively on monitoring of Canada's natural, untreated water bodies; marine beaches, lakes, and rivers. This report provides a comparison of different recreational water quality monitoring programs and practices across Canada, province by province, territory by territory. Recreational water monitoring and management on indigenous reserves is also explored. The report also presents the number of beaches monitored in each province and territory and the provincial or local recreational water monitoring bodies, their programs, and the monitoring frequencies within each jurisdiction. The report identifies the standards or guidelines used in the province, water quality indicators, and method of calculation used to determine whether beach water quality is suitable for recreational use. Finally—and with particular relevance to public health—the report discusses when and how swimming advisories are issued and communicated to the public.

## Key Findings

- ▶ All provinces monitor recreational water. However, only 6 of the 10 provinces have established recreational water quality monitoring guidelines: British Columbia, Alberta, Manitoba, Ontario, Québec, and Nova Scotia.
- ▶ Saskatchewan and New Brunswick are currently developing protocols for recreational water quality monitoring.
- ▶ Recreational water quality guidelines are not established in the Territories.
- ▶ Existing monitoring programs only cover a fraction of the marine beaches, lakes, and rivers where Canadians and visitors swim. Most Canadians swim at unmonitored or under-monitored locations.
- ▶ Recreational waters are monitored on-reserve in Canada.
- ▶ Every province with the exception of Newfoundland and Labrador monitor cyanobacteria (Blue-Green Algae) and cyanotoxins. Monitoring of cyanobacteria is increasing in frequency, and monitoring practices are becoming more standardized.
- ▶ Monitoring recreational water quality at marine, lake, and river beaches is not uniform across the country. Nor are monitoring practices, including reporting of test results to the public, uniform across municipalities within provinces and territories.
- ▶ Factors influencing recreational water quality monitoring practices include geography, climate, funding, as well as local priorities.
- ▶ Most provinces and territories do not issue rain advisories to recreational water users to help them avoid contact with contaminated water.
- ▶ With few exceptions, provinces and territories do not notify the public in the event of a sewage

bypass that could increase contamination a recreational water location.

- ▶ With few exceptions, provinces and territories do not notify the public when combined sewers overflow, contaminating recreational waters and increasing the risk of illness.

## Recreational Water Illnesses in Canada

The impact of poor water quality and the importance of recreational water quality monitoring of natural bodies of water

*Recreational waters can be considered as any natural fresh, marine or estuarine bodies of water where a significant number of people use the water for recreation.<sup>7</sup>*

Most cases of reported recreational water illnesses are contracted from treated water, such as swimming pools, water parks, and water play areas.<sup>8</sup> The Centres for Disease Control (CDC) found outbreaks at untreated, natural swimming locations accounted for approximately 23% of total recreational water outbreaks.<sup>9</sup> The CDC reports that recreational water illnesses and outbreaks are under reported due to barriers in detection, investigation, and reporting. Further, the CDC found that “variation in public health capacity and reporting requirements across jurisdictions, those reporting outbreaks most frequently might not be those in which outbreaks most frequently occur.”

There are three primary types of hazards that may be present when residents and visitors engage in recreational water activities in Canada’s natural, untreated water bodies: microbiological, chemical, and physical.

Harmful microorganisms or germs (bacteria, viruses, fungi, and protozoa) cause recreational water illnesses in untreated water (marine and freshwater beaches, lakes, rivers, and swimming holes). Sewage and polluted stormwater runoff are the main sources of water contamination that put the health of recreational water users at risk.

Swimming in contaminated water can lead to a number of illnesses and infections. Enteric illness

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<sup>7</sup> Health Canada, *Guidelines for Canadian Recreational Water Quality, Third Edition*, (Ottawa, Health Canada, 2012), 14.

<sup>8</sup> Centers for Disease Control, “Recreational Water Illnesses.” <http://www.cdc.gov/healthywater/swimming/swimmers/rwi.html> (accessed January 2017).; Michele C. Hlavsa; Virginia A. Roberts; Amy M. Kahler, Elizabeth D. Hilborn, Taryn R. Mecher, Michael J. Beach, Timothy J. Wade, Jonathan S. Yoder, Centers for Disease Control, *Outbreaks of Illness Associated with Recreational Water — United States, 2011–2012*, June 26, 2015 / 64(24);668–672 [https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6424a4.htm?s\\_cid=mm6424a4\\_w](https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6424a4.htm?s_cid=mm6424a4_w).

<sup>9</sup> Centres for Disease Control, *Outbreaks of Illness Associated with Recreational Water*.

(intestinal), diarrhea, and vomiting are the most frequent adverse health outcomes from contact with contaminated water.<sup>10</sup> Acute febrile respiratory illness (AFRI) along with skin rashes, eye and ear infections, and respiratory problems are also common recreational water illnesses. More serious diseases, such as human adenovirus, are also possible health outcomes from contact with contaminated water. Though less frequent, there is evidence that recreational water users can contract serious and potentially fatal diseases.<sup>11</sup> Waterborne pathogens can cause acute illnesses in swimmers and other recreational water users, including *Campylobacter* spp., *Cryptosporidium parvum*, *E. coli* O157, HAV, *Leptospira icterohaemorrhagiae*, *Salmonella typhi*, and *Shigella* spp. The World Health Organization's (WHO), outlines life-threatening diseases recreational water can contract:

Bacteria may cause life-threatening diseases such as typhoid, cholera and leptospirosis. Viruses can cause serious diseases such as aseptic meningitis, encephalitis, poliomyelitis, hepatitis, myocarditis and diabetes. Protozoa may cause primary amoebic meningoencephalitis (PAM) and schistosomiasis is caused by a flatworm (trematode).<sup>12</sup>

Further, sequelae, which are after-effects or conditions caused by a previous disease or condition, can also result from recreational water illnesses.

Recreational water illnesses are most commonly contracted by swallowing water—the faecal-oral route. Diseases can also be contracted by inhaling spray from, and physical contact with contaminated water.<sup>13</sup>

One of the first significant studies on the correlation between recreational water quality and illness among swimmers in Canada was a study conducted over the summer of 1980 at 10 Ontario beaches.<sup>14</sup>

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<sup>10</sup> United States Environmental Protection Agency, *Recreational Water Quality Criteria*, (Office of Water, 2012), 50; Health Canada, *Guidelines, Third Edition*, 38; Centers for Disease Control & Prevention, "Recreational Water Illnesses."

<sup>11</sup> Pond, *Water Recreation and Disease*, xvii.

<sup>12</sup> Pond, *Water Recreation and Disease*, 3.

<sup>13</sup> Centers for Disease Control, "Recreational Water Illnesses."; Michele C. Hlavsa; Virginia A. Roberts; Amy M. Kahler, Elizabeth D. Hilborn, Taryn R. Mecher, Michael J. Beach, Timothy J. Wade, Jonathan S. Yoder, Centers for Disease Control, *Outbreaks of Illness Associated with Recreational Water — United States, 2011–2012*, June 26, 2015 / 64(24);668-672 [https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6424a4.htm?s\\_cid=mm6424a4\\_w](https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6424a4.htm?s_cid=mm6424a4_w)

<sup>14</sup> P.L. Seyfried, Tobin RS, Brown NE, Ness PF, "A prospective study of swimming-related illness.I. Swimming-associated health risk," *American Journal of Public Health*. 75(9) (1985):1068-1070.

The results obtained from the water quality assessments of the beaches, and interviews with over 6,000 beach goers, indicated that “the overall crude symptom rates for swimmers were significantly higher than for nonswimmers, possibly due to the swimmer being exposed to the microflora in the water.”<sup>15</sup>

Dr. Margaret Sanborn and Dr. Tim Takaro (2013) wrote one of the most important studies on recreational water related illnesses in Canada.<sup>16</sup>

Their study found that, on average, swimmers have a 3% to 8% chance of becoming ill after water contact.<sup>17</sup> Children are at higher risk of gastrointestinal illness from swimming as they are much more likely to ingest water, play in the areas with the highest concentration of contamination (sand and nearshore), and spend extended time in the water. Athletes participating in sports with significant and prolonged contact with the water, such as surfing, open water swimming, and kitesurfing, are also at higher risk. Even secondary contact activities like boating and fishing increase recreational water users’ risk of acute gastrointestinal illness by 40% to 50% compared to non-water activities.<sup>18</sup>

Most significantly, Sanborn and Tamako found that, “The greatest risk of bacterial, protozoal, and viral gastroenteritis [among children] during the swimming season is likely not from exposure through food consumption, drinking water, or at day care, but rather from exposure to recreational water.”<sup>19</sup>

Other vulnerable members of the population include those with a compromised immune system, the elderly, pregnant women, and tourists.

Outbreaks of waterborne diseases related to recreational water use occur most frequently during the summer months when people are more likely to be swimming or in direct contact with recreational water. The incidence of recreational water illnesses is forecasted to increase with climate change (higher temperatures and severe weather events). This is due to a number of factors: longer swimming seasons and increased recreational activity, more favourable conditions for pathogens in water, and increased volumes of sewage and other contamination caused by wet

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<sup>15</sup> Seyfried et al., “A prospective study of swimming-related illness,” 1070.

<sup>16</sup> Margaret Sanborn and Tim Takaro, “Recreational water-related illness: Office management and prevention,” *Canadian Family Physician*, 59(5) (May 2013): 491-495. Accessed October 2016. <http://www.cfp.ca/content/59/5/491.full>

<sup>17</sup> Sanborn and Tamako, “Recreational water-related illness,” 491.

<sup>18</sup> *Ibid.*, 491.

<sup>19</sup> *Ibid.*, 492.

weather events.<sup>20</sup> Studies show that over the last 50 years, over 50% of waterborne disease outbreaks in the U.S. were associated with heavy rain events.<sup>21</sup> In the Great Lakes this number is even higher, at 66%.<sup>22</sup>

Municipal wastewater effluents are the largest single effluent discharges, by volume, in the country.<sup>23</sup> Canada releases over 200 billion litres of raw sewage and untreated wastewater into the country's waterways every year.<sup>24</sup> About 30% of Canadian communities have inefficient wastewater treatment, according to Environment and Climate Change Canada's last national survey.<sup>25</sup> The latest survey from 2009 indicated that 3% of Canadians receive no treatment for their sewage, 16% receive only primary treatment, and 13% were on septic or haulage systems.<sup>26</sup>

The impact of sewage on fresh, marine, and estuarine recreational waters across the country is significant.

In addition to pathogens, sewage and stormwater put recreational water users at risk from contact with chemicals, heavy metals, and biocides, pharmaceuticals, and other contaminants that are washed or dumped into the water.

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<sup>20</sup> Ibid., 492; Natural Resource Defense Council, *Rising Tide of Illness: How Global Warming Could Increase the Threat of Waterborne Diseases*. Natural Resource Defense Council, Washington, D.C., July 2010. Accessed September 2016. [https://www.nrdc.org/sites/default/files/GWillness4pgr\\_08.pdf](https://www.nrdc.org/sites/default/files/GWillness4pgr_08.pdf).

<sup>21</sup> Ibid., 2.

<sup>22</sup> Krystyn Tully, "Global Sustainable Cities: Water, Floods, Extreme Weather Presentation." Lake Ontario Waterkeeper Blog, June 21, 2016, <http://www.waterkeeper.ca/blog/2016/6/20/global-sustainable-cities-presentation-water-floods-extreme-weather>

<sup>23</sup> Canada. Environment and Climate Change Canada. Water Pollution. Wastewater. Wastewater Pollution. <https://www.ec.gc.ca/eu-ww/default.asp?lang=En&n=6296BDB0-1>, (accessed April 2017)

<sup>24</sup> Tompson, "Billions of litres of raw sewage."

<sup>25</sup> Canada, "2011 Municipal Water Use Report- Municipal Water Use 2009 Statistics" Environnement Canada, 2011. [https://ec.gc.ca/Publications/B77CE4D0-80D4-4FEB-AFFA-0201BE6FB37B/2011-Municipal-Water-Use-Report-2009-Stats\\_Eng.pdf](https://ec.gc.ca/Publications/B77CE4D0-80D4-4FEB-AFFA-0201BE6FB37B/2011-Municipal-Water-Use-Report-2009-Stats_Eng.pdf) ; Canada. "Municipal Wastewater Treatment Indicator," Environment & Climate Change Canada, <http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=2647AF7D-1> (accessed April 2017).

<sup>26</sup> Canada. "Environmental Indicators, Municipal Wastewater Treatment Indicator," Environment & Climate Change Canada, <http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=2647AF7D-1> (accessed April 2017).

## Fast Facts About Canadians and their Recreational Waters

- ▶ Swimming is the most-mentioned activity that Canadians like to do that involves water, followed by spending time on the beach and fishing. Nearly two-thirds of Canadians swim in lakes or rivers at least once per year.<sup>27</sup>
- ▶ In Canada, sewage and stormwater are the leading contributors to water pollution.<sup>28</sup> Human sources account for most recreational water illnesses.<sup>29</sup>
- ▶ Swimmers have a 3% to 8% chance of becoming ill after swimming.<sup>30</sup>
- ▶ Swimming is a substantial source of illness, especially in children, the elderly, and people with compromised immune systems.
- ▶ The risk of illness increases in more contaminated water.<sup>31</sup>
- ▶ Two-thirds of Canadians express concern about the quality of the water in rivers and lakes used for swimming.<sup>32</sup>
- ▶ Four in ten people in Québec, the Prairies, and Atlantic Canada do not swim in lakes and rivers. In Alberta it is 5 in 10.<sup>33</sup>
- ▶ Each summer, 6.5 million people visit Ontario beaches. Ontarians account for 89% of visits to the province's 300 beaches.<sup>34</sup> In other words, nearly half of Ontarians visit a beach each summer.<sup>35</sup>
- ▶ When people visit beaches, locals and visitors stimulate the local economy by spending on average \$170 per person. In 2014, there were 139.5 million visits in Ontario and visitors spent

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<sup>27</sup> Royal Bank of Canada, 2016 RBC Canadian Water Attitudes Study, 6.

<sup>28</sup> Canada. "Data Sources and Methods for the Municipal Wastewater Treatment Indicators."

<sup>29</sup> Sanborn and Tamako, "Recreational water-related illness," 492.

<sup>30</sup> Ibid, 491.

<sup>31</sup> Ibid.

<sup>32</sup> Royal Bank of Canada, 2016, 6

<sup>33</sup> Ibid., 77-78

<sup>34</sup> Ontario Ministry of Tourism, Culture, and Sport, Tourism Research Unit, *Ontario Beach Tourism Statistics 2014*, Toronto, 3, Accessed March 2017. <http://rto7.ca/Documents/Public/Reports-Ministry-of-Tourism-Culture-and-Sport/Ontario-Beach-Tourism-2014>

<sup>35</sup> 5,785,000-million visits (89% of 6.5 million people) averaged over Ontario's current population of 13.6 million people.



\$23.9 billion.<sup>36</sup>

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<sup>36</sup> Ontario Ministry of Tourism, Culture, and Sport, Tourism Research Unit, Ontario Beach Tourism Statistics 2014, Toronto, Winter 2017, Accessed March 2017. <http://rto7.ca/Documents/Public/Reports-Ministry-of-Tourism-Culture-and-Sport/Ontario-Beach-Tourism-2014>.

# Understanding Recreational Water Quality Monitoring in Canada: Federal Guidelines and Provincial and Territorial Jurisdiction

Health Canada's *Guidelines for Canadian Recreational Water Quality* were established in 1983 with the primary goal of protecting public health and safety. The 1983 Guidelines were based on the American National Technical Advisory Committee's (NTAC) recommendations to the Federal Water Pollution Control Administration on bacterial indicators of sewage contamination in recreational water from the 1960s. The NTAC recommended that a maximum of 200 faecal coliforms per 100 mL was the human health standard for recreational waters.<sup>37</sup> The *Guidelines* have been revised twice: in 1992 and, most recently, in 2012.

The *Guidelines for Canadian Recreational Water Quality* are prepared by the Federal-Provincial-Territorial (FPT) Working Group on Recreational Water Quality, established by the Federal-Provincial-Territorial Committee on Health and the Environment. The FPT Working Group on Recreational Water Quality was established in 1988, mandated to revise the 1983 Guidelines.<sup>38</sup> In preparing the Guidelines the Working Group worked together "to review and evaluate current scientific information on recreational water quality and develop up-to-date guidance."<sup>39</sup> Most recently the Working Group prepared the Third Edition (2012) of the Guidelines.

The provincial members of the FPT Working Group on Recreational Water Quality included representatives from 8 of the ten provinces. Federal members include Environment Canada and the US Environmental Protection Agency. Health Canada is the Secretariat of the Guidelines. There are no members, corresponding members, or invited members from Canada's territories in the Working Group. There are also no members, corresponding members, or invited members specifically representing recreational water quality monitoring on indigenous reserves.

Comparable to other national and international approaches, the Guidelines developed by the FPT Working Group provide a framework for provincial and local bodies responsible for the management of recreational waters.

Of note, these federal guidelines are just that: guidelines. The Guidelines are not legally enforceable standards. The health programs and services related to recreational water are only legally

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<sup>37</sup> Ontario Ministry of the Environment. *Microorganisms in Recreational Waters: Scientific Criteria Document for Standard Development No. 1-84*, Toronto, 1985, 3.

<sup>38</sup> Health and Welfare Canada, *Guidelines for Canadian Recreational Water Quality*, (Ottawa, Health and Welfare Canada, 1992), 5.

<sup>39</sup> *Ibid*, 8.

enforceable at the provincial and territorial level, or if adopted by a federal agency, such as the Public Health Agency of Canada. In other words, a federal agency can adopt the criteria as a "standard" and thereby make it legally enforceable. Authorities in provinces and territories can and often do share the responsibility of beach management with beach managers or local service providers, such as municipalities.

Recreational water quality generally falls under provincial and territorial jurisdiction. Responsibility for the safe management of recreational waters can be shared between the provincial or territorial authorities and the beach managers or service providers.<sup>40</sup>

Health Canada's Guidelines for *Canadian Recreational Water Quality* serve a similar purpose as the U.S. Environmental Protection Agency's (EPA) Recreational Water Criteria: to set forth the best recreational water quality guidelines to protect human health, based on scientific knowledge, for provinces and territories.

In the USA, the Clean Water Act requires the EPA to develop recreational water quality criteria.

Under §304(a)(1) of the Clean Water Act (CWA) of 1977 (P.L. 95-217) the Administrator of the EPA is directed to develop and publish water quality criteria (WQC) that accurately reflect the latest scientific knowledge on the kind and extent of all identifiable effects on health and welfare that might be expected from the presence of pollutants in any body of water, including groundwater.<sup>41</sup>

Note: In Canada, the basis for Health Canada's legislated role as a federal authority on environmental assessments (EA) of Drinking and Recreational Water Quality and Human Health Risk Assessment (HHRA) comes from the *Canadian Environmental Assessment Act, 2012 (CEAA 2012)*.<sup>42</sup> Health Canada provides expertise as a federal authority on Drinking and Recreational Water Quality and HHRA to responsible authorities.

## **Monitoring and Management of Recreational Water Quality in Indigenous Communities**

We've established that provinces and territories have primary jurisdiction over recreational water

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<sup>40</sup> Health Canada. *Guidelines, Third Edition*, 8.

<sup>41</sup> United States Environmental Protection Agency, *Recreational Water Quality Criteria*, 1.

<sup>42</sup> Canada. "Health Canada's Participation in Environmental Assessments," Health Canada, <http://healthycanadians.gc.ca/publications/departement-ministere/hc-sc/environmental-assessment-evaluation-environnementale/index-eng.php> (accessed December 8, 2016).

quality in Canada.

Recreational water quality monitoring in indigenous communities differs widely across the country. The federal government's role is ambivalent, as there is no regulatory body specifically working on recreational water quality in indigenous communities. Typically, management of recreational water quality and recreational water quality monitoring programs is a collaborative effort involving First Nations Chiefs and Environmental Health Officers and can include provincial and municipal health authorities.

### ***Understanding the responsibility for recreational water quality monitoring on indigenous reserves in Canada***

While provinces have a general responsibility to indigenous peoples living off reserve, under the Constitution Act of 1867 the federal government of Canada has a responsibility to indigenous people living on reserve. Indigenous communities on reserve fall under the jurisdiction of the Ministry of Indigenous and Northern Affairs. The federal government has a special responsibility for protecting the health of indigenous people living on reserve, and the health impacts of drinking and recreational water quality on the health of indigenous people is part of this federal responsibility.

Health Canada is responsible for providing health services to First Nations and Inuit people. The government of Canada established the First Nations and Inuit Health Branch (FNIHB) as a department within Health Canada. FNIHB is responsible for public health and delivering health services on reserves.

Monitoring water quality is part of FNIHB's programs and services.<sup>43</sup>

FNIHB's Environmental Public Health Program works in First Nations communities to "identify and prevent environmental public health risks that could adversely impact the health of community residents."<sup>44</sup> The Environmental Public Health Program provides services to indigenous communities south of the 60th parallel. Some indigenous communities have chosen to deliver their own health services (transferred communities), whereby the community or Tribal Council employs the Environmental Health Officer directly. (Responsibility for environmental public health programming north of the 60th parallel was transferred to territorial governments or First Nations and Inuit control as part of land claims settlements in the 1980s.)

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<sup>43</sup> Canada. "First Nations and Inuit Health Branch," Health Canada, <http://www.hc-sc.gc.ca/ahc-asc/branch-dirgen/fnihb-dgspni/fact-fiche-eng.php> (accessed January 2017).

<sup>44</sup> Canada, "First Nations and Inuit Health, Environmental Public Health," Health Canada, <http://www.hc-sc.gc.ca/fnihb-spni/promotion/public-publique/index-eng.php> (accessed January 2017).

The First Nations Environmental Public Health Program's public health assessment activities include seasonal recreational water quality monitoring in the following recreational facilities:

Arenas, beaches, billiard halls, bingo halls, bowling alleys, campgrounds, casinos, community centres, curling rinks, golf courses, parks, playgrounds and swimming facilities. In addition, seasonal monitoring of recreational water may be provided.<sup>45</sup>

In certain indigenous territories in Canada, recreational waters are more at risk from significant development projects, such as oil and gas and mining. In such cases, under the *Canadian Environmental Assessment Act (CEAA), 2012*, Health Canada participates in environmental assessments as a federal authority.<sup>46</sup> The key objective of Health Canada's EA program is to prevent, reduce and mitigate the potential effects of any change to the environment (such as exposure to contaminants through air, water or country foods) on the health of Aboriginal peoples."<sup>47</sup>

The environmental effects taken into account in the CEAA, with respect to recreational water in indigenous communities, are related to development projects on federal lands. Federal lands are defined as "reserves, surrendered lands and any other lands that are set apart for the use and benefit of a band and that are subject to the Indian Act, and all waters on and airspace above those reserves or lands."<sup>48</sup>

Section 5 c (i) of CEAA 2012 defines federal responsibility for protecting the health of indigenous people on reserve:

(c) with respect to aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on

- (i) health and socio-economic conditions,
- (ii) physical and cultural heritage,
- (iii) the current use of lands and resources for traditional purposes, or
- (iv) any structure, site or thing that is of historical, archaeological, paleontological or

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<sup>45</sup> Health Canada, First Nations and Inuit Health Branch, *First Nations Environmental Public Health Program*, 2008, 14, Accessed January 2017. [http://www.hc-sc.gc.ca/fniah-spnia/alt\\_formats/fnihb-dgspni/pdf/pubs/promotion/2009\\_env\\_prog-eng.pdf](http://www.hc-sc.gc.ca/fniah-spnia/alt_formats/fnihb-dgspni/pdf/pubs/promotion/2009_env_prog-eng.pdf).

<sup>46</sup> *Canadian Environmental Assessment Act*, 2012, c. 19, s. 52.

<sup>47</sup> Canada. "Health Canada's Participation in Environmental Assessments."

<sup>48</sup> *Canadian Environmental Assessment Act*, c. 19, s. 52.

architectural significance.<sup>49</sup>

Note that CEAA requirements and processes are only applicable for the review of significant development projects that would require federal ministry review under that Act, for example, mines, pipelines, and oil and gas extraction. Recreational water quality monitoring on indigenous reserves in this capacity is very limited. Typically, monitoring would only cover pre-development proposals. Post-development monitoring would rest with the proponent, such as the company responsible for the project.<sup>50</sup> “Post development monitoring would typically only be done by the proponent if specifically outlined as a condition of approval and/or during a spill/release event.”<sup>51</sup>

Recreational water quality management and monitoring on indigenous reserves across Canada is further explored in the provinces and territories section of the report.

## **Canada: 2012 Guidelines for Canadian Recreational Water Quality, 3rd Edition**

The stated primary purpose of the Health Canada’s *Guidelines for Canadian Recreational Water Quality* is “the protection of public health and safety.”<sup>52</sup> The Guidelines for Canadian Recreational Water were developed to guide decisions of provincial and local authorities, since recreational water quality falls generally under provincial and territorial jurisdiction.<sup>53</sup>

The document does not set forth legally enforceable federal recreational water quality standards and protocols. Rather, the recommendations outlined in the Guidelines are only legally enforceable “where adopted by the appropriate provincial/territorial or federal agency.”<sup>54</sup>

The Guidelines provide a framework to help prevent illness among people in contact with water polluted with faeces.

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<sup>49</sup> Ibid.

<sup>50</sup> Linda Pillsworth, personal communication, email, December 13, 2016.

<sup>51</sup> Simon Sihota, personal communication, phone interview and email, February 13, 2017.

<sup>52</sup> Health Canada. *Guidelines, Third Edition*, 3..

<sup>53</sup> Ibid., 9.

<sup>54</sup> Ibid., 15

## Federal Recreational Water Quality Guidelines

Both fresh and marine water quality guidelines in Canada tolerate a gastrointestinal illness rate of 1% to 2%. In other words, the minimum protective standard recommended in Canada is: for every 1000 swimmers, 10 to 20 people will contract a gastrointestinal issue (or worse) following their swim.<sup>55</sup> More than that is considered unacceptable.

About 80% of Canadians live in a population centre, which is considered a community of 1000 people or more and with more than 400 people per square kilometre.<sup>56</sup> In Canada, recreational water quality monitoring is largely limited to official beaches and swim spots that are part of the country's small, medium, and large population centres.

One of the main reasons recreational water quality monitoring is limited to official beaches in population centres is that higher swimmer populations increase the health risks for bathers and leave more people at risk of contracting a recreational illness. These beaches are also more likely at risk of contamination from stormwater, sewage and other sources of urban and agricultural pollution generated by these population centres.

Few regions, provinces, and territories have routine water quality testing or monitoring. Although the vast majority of the population in Canada lives in areas where beaches are monitored, "most swimming in Canada occurs in unmonitored water."<sup>57</sup> Further, in Canada, "owing to geography and climate," a much larger percentage of the population engages in recreational water activities in freshwater rather than marine water.<sup>58</sup>

## Parameters

### *Indicator Bacteria*

Sewage and stormwater contain many contaminants that can make recreational water users sick, including disease-causing pathogens, pharmaceuticals, heavy metals, chemicals, and plastics. However, it is very expensive to test and difficult to analyze everything that can be found in sewage

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<sup>55</sup> Health Canada. Guidelines, Third Edition, 27.

<sup>56</sup> Canada. "From Urban Areas to Population Centres," Statistics Canada, <http://www.statcan.gc.ca/eng/subjects/standard/sgc/notice/sgc-06> (December 2017).

<sup>57</sup> Sanborn and Tamako, "Recreational water-related illness," 491.

<sup>58</sup> Health Canada. Guidelines, Third Edition, 34.

and stormwater. Frequent and rapid testing is required for efficiency in identifying a problem and warning people about the risk.

The solution, worldwide, has been to test for indicator bacteria. All indicator bacteria are faecal, and they are meant to serve as surrogates to the bigger, badder contaminants found in sewage. *E. coli* is considered the best indicator of faecal pollution in freshwater. Intestinal *enterococci* is the best indicator of contamination in marine water. When levels of indicator bacteria are higher than the minimum protective standard, this translates to an increase in the number of people who will get sick.

The *Guidelines for Canadian Recreational Water Quality* advocate the use of both a geometric mean and a single sample limit for measuring indicator bacteria.

The use of dual limits allows recreational water operators to better evaluate the water quality both in the short term and over the duration of the swimming season. The single-sample limit will alert management to any immediate water quality issues, whereas the geometric mean limit will alert management to chronic contamination problems. This dual approach represents good monitoring practice as part of an overall commitment to a strategy of risk management for recreational waters.

The 2012 edition of the Guidelines reaffirms existing federal *E. coli* guidelines for primary contact recreation:

- 200 *E. coli* / 100 mL – geometric mean at least 5 samples
- 400 *E. coli* / 100 mL – single sample maximum

In marine recreational waters, *enterococci* is the most appropriate indicator of faecal contamination, with guidelines values as follows:

- 35 *Enterococci* / 100 mL – geometric mean at least 5 samples
- 70 *Enterococci* / 100 mL – single sample maximum

In addition, the 2012 Guidelines added new secondary contact guidelines, which should not exceed five times the value for primary contact:

- 1000 *E. coli* / 100 mL – geometric mean of at least 5 samples

The guideline values were developed “based on epidemiological evidence relating to *E. coli* concentrations in fresh recreational waters to the incidence of swimming-associated gastrointestinal illness observed among swimmers.”<sup>59</sup>

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<sup>59</sup> Ibid, 27.



Health Canada has based its rationale on the US EPA's analysis of epidemiological data, determining that using guideline values for both *E. coli* and *enterococci* will correspond to a GI illness rate of 10 to 20 illnesses per 1000 swimmers - between 1% and 2%.<sup>60</sup> Note that the most recent EPA Recreational Water Quality Criteria values for both *E. coli* and *enterococci* correspond to a GI illness rate of 32 and 36 illnesses per 1000 swimmers.<sup>61</sup>

### ***Cyanobacteria and toxic algae***

Blue-green algae is a form of bacteria called cyanobacteria. These prehistoric bacteria grow in slow moving or still water. Blue-green algae can survive in all kinds of conditions and tolerate incredible environmental stresses.

While 30% to 50% of cyanobacteria are not harmful, there are several species of cyanobacteria that can produce toxins (known collectively as cyanotoxins) as the cells die or get eaten by other organisms. Cyanotoxins can cause all kinds of adverse health effects to humans and animals. If a person has contact with toxic algae, they can develop skin irritations and/or allergic reactions in their eyes, ears, nose, throat; ingesting the toxins, by eating contaminated fish or accidentally swallowing water while swimming, kayaking, or falling off a stand up paddle board can cause a number of side effects, including headaches, diarrhea, vomiting, fever, abdominal pain, and general malaise.

In Canada, the Guidelines include recommendations for monitoring and managing cyanobacteria. The guidelines for blue-green algae were determined to specifically protect children in contrast to other water quality limits that are designed to protect adults. Children are likely to ingest water while swimming, and they suffer more intense adverse health problems when exposed to cyanobacteria and toxic algae.<sup>62</sup>

The Guidelines recommend recreational water quality criteria for cyanobacteria:

- 100,000 cells of cyanobacteria /mL
- 20 µg/L total microcystin (a toxin of cyanobacteria)

Canada's cyanobacteria and toxic algae guidelines are based on the WHO's criteria; however, the EPA's new criteria is stricter. Published as a draft on 12 December 2016 under the working title Human Health Recreational Ambient Water Quality Criteria and/or Swimming Advisories for

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<sup>60</sup> Ibid, 27.

<sup>61</sup> United States Environmental Protection Agency, *Recreational Water Quality Criteria*, 43.

<sup>62</sup> Ibid., 83.

Microcystins and Cylindrospermopsin,<sup>63</sup> the recommended criteria for cyanobacterial toxins in the USA are:

- Microcystins: 4 µg/L
- Cylindrospermopsin: 8 µg/L

The new EPA cyanobacteria criteria will be finalized once public comments have been reviewed.

Canada does not have recreational water quality guidelines for cyanobacterial toxins other than microcystin. In fact, with the exception of the EPA's 2016 draft for cyanotoxins, criteria for cyanotoxins other than microcystin have not yet been developed anywhere.

### ***Other Parameters***

The Guidelines also provide considerations for other parameters such as pH, temperature, chemical hazards, and aesthetics objectives such as turbidity, clarity and colour, oil and grease, and litter. However, Health Canada has not developed guidelines and objectives for most of these additional parameters.<sup>64</sup>

## **Monitoring Frequency**

Water quality, like the weather, can change quickly and often. The frequency at which recreational water quality is monitored, therefore, impacts how well health risks are communicated to the public.

According to Canada's Guidelines for Recreational Water Quality, section 3.1.1, Frequency of Microbiological Sampling, "Decisions regarding the frequency of water samples collected for microbiological analysis should be made by the appropriate local or regional authority."<sup>65</sup>

Health Canada's *Guidelines for Canadian Recreational Water Quality* officially recommends a

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<sup>63</sup> United States. "Human Health Recreational Ambient Water Quality Criteria and/or Swimming Advisories for Microcystins and Cylindrospermopsin," Environmental Protection Agency, <https://www.epa.gov/wqc/microbial-pathogenrecreational-water-quality-criteria#swimming> (accessed April 2017).; United States. "Human Health Recreational Ambient Water Quality Criteria and/or Swimming Advisories for Microcystins and Cylindrospermopsin - Draft," Environmental Protection Agency, 822-P-16-002 December 2016, <https://www.epa.gov/sites/production/files/2016-12/documents/draft-hh-rec-ambient-water-swimming-document.pdf>

<sup>64</sup> Health Canada, Guidelines, Third Edition,,4.

<sup>65</sup> Ibid., 16.

minimum recreational water quality sampling frequency of once per week during the swimming season. However, the Guidelines support more frequent water quality monitoring (daily as opposed to weekly) to allow monitoring bodies to more reliably observe water quality trends, make more informed decisions regarding the suitability for swimming of recreational water bodies, react more quickly to water quality problems, and track chronic water quality issues.

The Guidelines also recommend collecting samples when events that are known to negatively impact water quality occur, for example, following heavy rain or on weekends when there are more swimmers in the water.

### ***Reduced monitoring***

The *Guidelines* also offer recommendations for reduced monitoring. These reduced monitoring recommendations are intended for water bodies with either long-term good water quality or chronically poor water quality. Swim sites in remote locations or with few recreational water users can also be considered for a reduced monitoring schedule.

## **Communication of Health Risk and Beach Water Quality Results**

*The primary reason for monitoring bathing water quality and for informing the public is to protect public health.*<sup>66</sup>

There is great value in informing the public about the current recreational water quality at their recreational water sites. First and foremost, communicating recreational water information to the public helps to prevent illness. Informing people about the quality of their recreational water helps to protect their health, which is the core of recreational water quality monitoring.

The Guidelines state:

In order to participate in safe, enjoyable recreational water activities, the public requires access to information on the quality of the area and its facilities, as well as notification of any existing water quality hazards. Beach operators, service providers and responsible authorities have a responsibility to inform and educate the public and provide adequate warnings about any hazards relevant to their recreational water areas.<sup>67</sup>

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<sup>66</sup> Jamie Bartram and Gareth Rees (Eds)., *Monitoring Bathing Waters: A Practical Guide to the Design and Implementation of Assessments and Monitoring Programmes* World Health Organization, London, 2000, Accessed February 2017. [http://www.who.int/water\\_sanitation\\_health/bathing/monbathwat.pdf](http://www.who.int/water_sanitation_health/bathing/monbathwat.pdf).

<sup>67</sup> Health Canada, *Guidelines, Third Edition*, 20.

The benefits of public awareness and communication of recreational water quality information can: reduce the potential risk of swimmer illness or injury; improve the quality of the water; correct public misconceptions regarding water quality; improve public confidence; and increase beach attendance.<sup>68</sup>

In areas of Canada where beach water quality is monitored, signage or advisory posts let the public know whether the water met, or failed to meet, recreational water quality criteria. If the most recent test results fail to meet the local water quality criteria, be they a standard, model, or guidelines, additional signage or warnings at the site are recommended. Such signs or warnings should include details about the health risk, the monitoring body, and next steps.

In addition, water quality results and advisories are communicated through various platforms, such as government and/or health authority websites, local news sources, beach hotlines, and on the radio. Social media sites such as Facebook and Twitter have also become popular channels through which recreational water quality information is shared. When asked “How much do you trust each of the following to provide you with information about water quality and safety in Canada?” Canadians placed most trust in Regional Watershed/Conservation Authorities and non-governmental organizations such as environmental and social advocacy groups, followed by third party water quality monitors and municipal governments.<sup>69</sup> Most people look for recreational water quality information on municipal websites, followed by on-site information at the beach, lake, or river.<sup>70</sup>

The best way to reduce recreational water illnesses is by preventing people from being exposed to contaminants. The Guidelines suggest that reducing monitoring and discouraging recreational water use in areas with chronic water quality programs is an option.

It may also be good to reduce monitoring frequencies for recreational water areas that consistently demonstrate poor water quality results, but only where appropriate management actions are taken to discourage recreational use, and provided that the risks are clearly communicated to the public.<sup>71</sup>

However, putting up “no swimming signs” is never a true solution. Rather than keeping people out of the water permanently, the best practice is to address water contamination by taking steps to

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<sup>68</sup> Health Canada, *Guidelines, Third Edition*, 20.

<sup>69</sup> Royal Bank of Canada, *2017 RBC Canadian Water Attitudes Study*, 88.

<sup>70</sup> Ibid.

<sup>71</sup> Health and Welfare Canada, *Guidelines* 16.

return water to a swimmable state.

## Preventive Multi-Barrier Approach

*A preventive multi-barrier approach to management that focuses on the identification and control of water quality hazards and their associated risks before the point of contact with the recreational water user represents the best strategy for the protection of public health from risks associated with recreational waters. Reactive management strategies relying on compliance monitoring alone will not be sufficient in protecting the health of the recreational water user.<sup>72</sup>*

Health Canada recommends a multi-barrier approach as the best strategy to protect public health from recreational water illnesses. A multi-barrier approach identifies all impediments to water suitable for swimming and creates barriers, such as “source protection, monitoring, hazard control, communication, consultation”<sup>73</sup> to both eliminate the hazards and minimize their impact on human health. The multi-barrier approach for recreational water quality is based on the “source-to-tap” approach used in protecting the integrity of drinking water in Canada.<sup>74</sup> It is a best practice approach recommended by the WHO in the “Annapolis Protocol” and detailed in WHO’s 2013 *Guidelines for Safe Recreational Water Environments*.

The *Guidelines for Canadian Recreational Water Quality* strongly recommend as a best practice that beach managers employ a multi-barrier approach to assessing and managing water quality problems.

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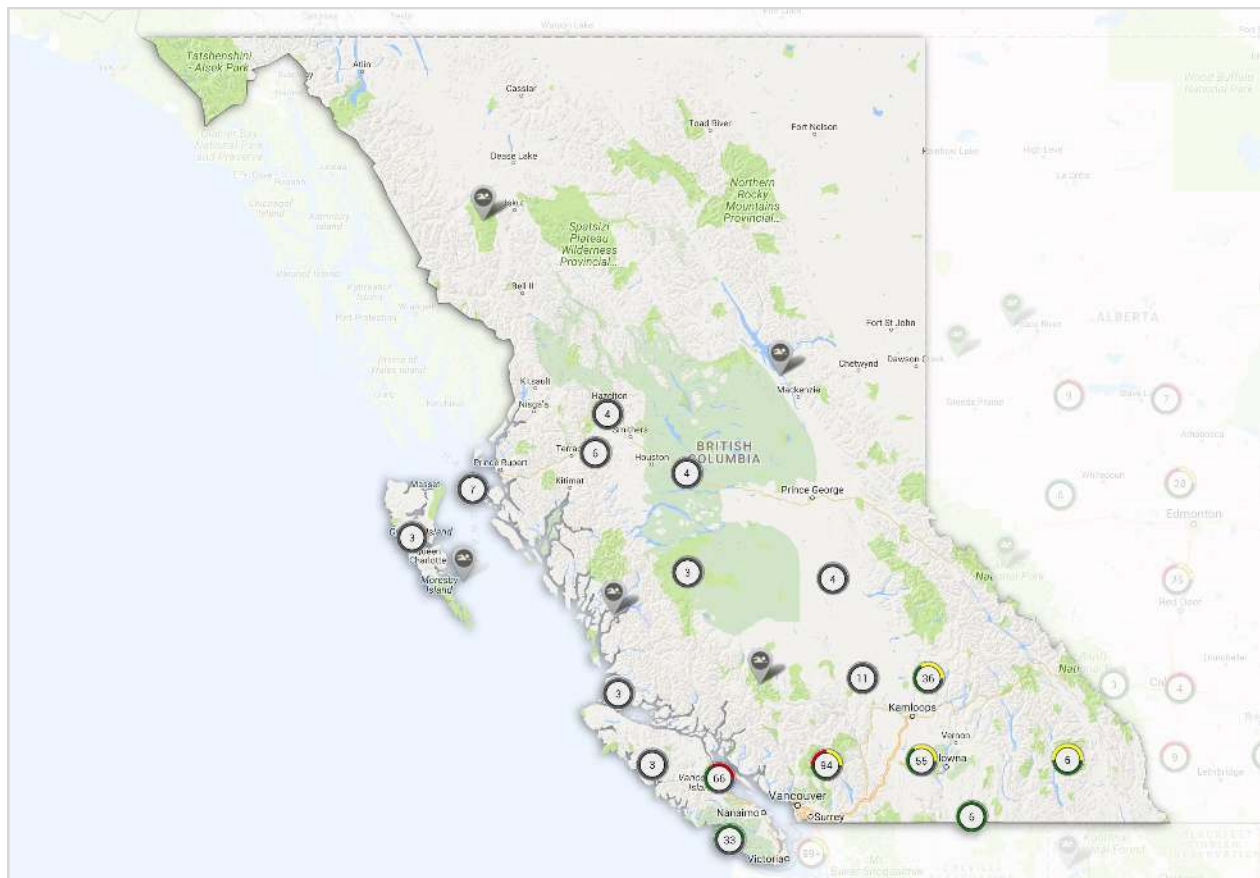
<sup>72</sup> Health Canada, *Guidelines, Third Edition*, 10.

<sup>73</sup> *Ibid.*, 6.

<sup>74</sup> *Ibid.*, 11.

# Provinces and Territories: Recreational water quality standards and protocols

## British Columbia



There are approximately 450 designated freshwater, estuarine, and marine water recreational water locations in British Columbia.

The British Columbia Ministry of Environment sets water quality guidelines for the protection of designated water uses, including recreation, drinking, support of aquatic life, wildlife, and agriculture. British Columbia's water quality guidelines represent safe levels of substances to protect designated water uses. Recreational water quality is assessed using the British Columbia Ministry of the Environment's Recreational Water Quality Guidelines for ambient water.

The Ministry of Environment may also set water quality objectives for specific water bodies. The objectives are set to protect the most sensitive designated use for a water body, thereby protecting

all other designated uses. The Ministry conducts water quality objectives attainment monitoring on a water body-specific basis, and water quality for recreational use is assessed where recreation is a designated use. The British Columbia Provincial Lake Sampling Program also monitors water quality in lakes across the province, many of which are used for recreational purposes.<sup>75</sup>

There is no specific provincial legislation for the regulation of recreational waters, beaches, or water access points in British Columbia.<sup>76</sup> The legislative mandate regarding recreational water comes from the province's Public Health Act. Health authorities are mandated under sections 77 and 83 to "reduce health hazards and promote healthy living in British Columbia."<sup>77</sup> Specifically, Environmental Health Officers (EHOs) are mandated under Section 77, Division 4: Environmental Health Officers, Role of environmental health officers, and local governments are mandated under Section 83, Division 6: Local Governments, Role of local government to monitor recreational water quality if required or take actions to reduce health hazards and protect the public from health risks associated with recreational water.<sup>78</sup>

The implementation and management of recreational water quality at beaches in British Columbia is the responsibility of the province's Health Authorities. Beach owners and operators oversee the operations of the beaches and work in coordination with Health Authorities and Environmental Health Officers.

In general, the federal *Guidelines for Canadian Recreational Water Quality* are followed throughout the province of British Columbia. In April 2016, the government of British Columbia published a set of recommendations for recreational water quality monitoring in the province called *Model Recreational Water Quality Program: British Columbia Health Authorities Implementation of the Guidelines for Canadian Recreational Water Quality, 3rd Edition*. The model recommends that health authorities follow the federal guidelines for Canadian Recreational Water Quality for faecal coliform and cyanobacteria and cyanotoxin monitoring. The document "provides recommendations for application of a provincially consistent model for recreational water program for beaches," and "is intended to support a clear and consistent approach to delivery of recreational water programs

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<sup>75</sup> Heather Granger, personal communication, British Columbia Ministry of Environment, Water Protection, and Sustainability Branch, April 12, 2016.

<sup>76</sup> British Columbia, *Model Recreational Water Quality Program: BC Health Authorities Implementation of the Guidelines for Canadian Recreational Water Quality, 3rd Edition* (British Columbia Health Authorities, April 2016), 1,4.

<sup>77</sup> *Ibid.*, 2.

<sup>78</sup> Canada. British Columbia. *Public Health Act*, 2008, c. 4, s. 77; Canada. British Columbia. *Public Health Act*, 2008, c. 6, s. 83.

across BC.”<sup>79</sup>

Six provincial health authorities monitor freshwater and marine beaches in British Columbia<sup>80</sup> It is up to these health authorities to create and implement recreational water quality monitoring at beaches in their regions. This is often carried out in coordination and collaboration with municipal governments, beach owners and operators, and the public. Municipalities also monitor recreational waters and take action to reduce health hazards and protect the public from health risks associated with recreational water.

Protocols specific to cyanobacterial toxins in British Columbia recreational water exist at the provincial level under the *Decision Protocols for Cyanobacterial Toxins in British Columbia Drinking Water and Recreational Water*. These cyanobacteria-related protocols are designed to standardize the monitoring, action processes, and communication strategies for blue-green blooms and toxic algae.<sup>81</sup>

### ***Parameters for monitoring recreational water quality***

#### **Indicator Bacteria**

In addition to freshwater swimming sites, most recreational water environments in British Columbia feature marine or brackish water. Recreational water quality is measured by testing levels of faecal coliform bacteria: *E. coli* (usually in freshwater) and *enterococci* (in marine or brackish water). However, *E. coli* is considered acceptable for marine waters if there are studies to back up testing for this indicator.<sup>82</sup>

The *Model Recreational Water Quality Program* underlines that “sample results only correlate to the next 2 days’ water quality therefore a dual approach of using single sample maximums and

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<sup>79</sup> British Columbia Health Authorities, *Model Recreational Water Quality Program*, 1.

<sup>80</sup> British Columbia. "Regional Health Authorities." <http://www2.gov.bc.ca/gov/content/health/about-bc-s-health-care-system/partners/health-authorities/regional-health-authorities> (accessed August 17, 2016).

<sup>81</sup> British Columbia, Environmental Protection and Sustainability, *Decision Protocols for Cyanobacterial Toxins in British Columbia Drinking Water and Recreational Water*, 3 September 2015, Accessed November 22, 2016. <http://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/documents/cyanobacteria-sampling-protocols-sept3-2015.pdf>.

<sup>82</sup> “*E. coli* (Section 4.1.1) is also recognized as a useful predictor of the risk of gastrointestinal illness in marine recreational waters (Wade et al., 2003). If it can be shown that *E. coli* can adequately demonstrate the presence of faecal contamination in marine waters, then the *E. coli* maximum limit for fresh waters may be adopted. If there is any doubt, samples should be examined for both sets of indicators for extended periods to determine whether a positive relationship exists.” Health Canada, *Guidelines, Third Edition*, 34.



geometric mean limits is recommended.”<sup>83</sup>

The following are microbiological water quality guidelines from X.

### **Primary contact guidelines**

#### **E. Coli**

- 200 *E. coli* / 100 mL – geometric mean at least 5 samples
- 400 *E. coli* / 100 mL – single sample maximum

#### **Enterococci**

- 35 *enterococci* / 100 mL – geometric mean at least 5 samples
- 70 *enterococci* / 100 mL – single sample maximum

Immediate resampling is recommended following a single sample exceedance.

### **Secondary contact guidelines**

Indicator bacteria should not exceed five times the value for primary contact.

- *E. coli*:  $(5 \times 200/100 \text{ mL}) = 1000 \text{ E. coli}/100 \text{ mL}$  (geometric mean of at least 5 samples)
- *Enterococci*:  $(5 \times 35/100 \text{ mL}) = 175 \text{ enterococci}/100 \text{ mL}$  (geometric mean of at least 5 samples)

### **Cyanobacteria**

Water bodies suspected to have cyanobacterial blooms are monitored according to the Health Canada Guidelines. The guidelines’ recommendations serve as British Columbia’s standardized, province-wide protocol under *Decision Protocols for Cyanobacterial Toxins in British Columbia Drinking Water and Recreational Water*.<sup>84</sup>

- Microcystin-LR not exceed 1.5 µg/L (drinking water)
- Total cyanobacteria not exceed 100,000 cells/mL and total microcystins not exceed 20 µg/L (expressed as microcystin-LR) (recreational water)

Locations and sources of cyanobacteria blooms and toxic algae vary throughout the province, and therefore monitoring and management varies from region to region. While the province has a recommended protocol, there are a number of variations of how cyanobacteria and cyanotoxins are monitored and managed by the province’s six health authorities.

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<sup>83</sup> British Columbia Health Authorities, *Model Recreational Water Quality Program*, 3.

<sup>84</sup> British Columbia, *Decision Protocols for Cyanobacterial Toxins in British Columbia Drinking Water and Recreational Water*, 2015.

### ***Communication, beach postings, and advisories***

The province emphasizes that communication between the Environmental Health Officers, administration, Medical Health Officers, stakeholders, and the public is key to achieving the goals of recreational water quality monitoring programs, which aim to:

- Reduce risk of swimmer illness or injury
- Improve water quality
- Correct public misconceptions regarding water quality
- Improve public confidence
- Increase beach attendance<sup>85</sup>

The British Columbia model recommends public awareness through a combination of communication channels, including visual and written cues on beach signs, websites, and use of media outlets.

### ***British Columbia Health Authorities***

The implementation and management of recreational water quality at beaches in British Columbia is the responsibility of the province's Health Authorities.<sup>86</sup> Health authorities are mandated under the Public Health Act (section 77 and 83) to "reduce health hazards and promote healthy living in British Columbia."<sup>87</sup>

Local health authorities monitor water quality at recreational swimming spots in British Columbia, and municipalities also monitor recreational water quality.

Health authorities may sample the water quality of recreational beaches or create reports on recreational water quality concerns to help inform them of any public health risks. At their discretion, they may decide to close beaches, issue public advisories or post warning signs based on these sampling results, until the water samples indicate that it is safe to resume swimming in these waters.<sup>88</sup>

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<sup>85</sup> British Columbia Health Authorities, *Model Recreational Water Quality Program*, 13,14.

<sup>86</sup> Ibid., 1,4.

<sup>87</sup> Ibid, 2.

<sup>88</sup> British Columbia, "Recreational Water Quality", Environmental Protection & Sustainability, <http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/recreational-water-quality> (accessed November 22, 2016).

The Health Authorities in British Columbia are:

#### Regional Health Authorities

- Fraser Health
- Interior Health
- Northern Health
- Vancouver Coastal Health
- Island Health

#### First Nations

- First Nations Health Authority

Under British Columbia's *Public Health Act*, health authorities have legislative power to close beaches for primary recreational activities and take other actions to protect public health from risks associated with recreational water.<sup>89</sup>

In general, health authorities and municipalities monitor beach water quality from April to September. Samples are usually collected weekly, with a monthly minimum of 5 samples. However, there are wide variations within the province when it comes to how and when water quality is monitored for recreational quality.

#### Vancouver Coastal Health (+80 beaches)

Coast Garibaldi: 50 designated public beach sites along the Sea to Sky corridor (Squamish, Whistler, and Pemberton) and the Sunshine Coast (Gibsons, Sechelt, and Powell River)<sup>90</sup>; Vancouver, Richmond, and North Shore: 25 beaches (2016 sampling)<sup>91</sup>

; Bowen Island: 6 Beaches

With the exception of Trout Lake, Vancouver Coastal Health does not sample or test beach water directly. Metro Vancouver conducts sampling and analysis of beach water quality at designated sites. Municipalities in Coast Garibaldi and Bowen Island manage their own monitoring programs.

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<sup>89</sup> Canada. British Columbia. *Public Health Act*, 2008, c. 4, s. 77; Canada. British Columbia. *Public Health Act*, 2008, c. 6, s. 83.

<sup>90</sup> Vancouver Coastal Health. "Environmental Health Services – Coast Garibaldi Area," <http://healthspace.ca/vch>

<sup>91</sup> Vancouver Coastal Health, *Beach Water Quality*, September 29, 2016 [http://www.vch.ca/media/Beach\\_Water\\_Quality\\_Report\\_September\\_29\\_2016.pdf](http://www.vch.ca/media/Beach_Water_Quality_Report_September_29_2016.pdf); Vancouver Coastal Health, *Beach Water Quality*, September 1, 2016, Accessed December 2016 .<http://www.vch.ca/Documents/Beach-water-quality-report-metro-Vancouver.pdf>

Metro Vancouver area beaches are monitored throughout the swimming season, which officially runs from end of May to early September. Testing is conducted to determine compliance with the national *Guidelines for Canadian Recreational Water Quality* for primary contact recreational activities.<sup>92</sup>

As mentioned, *E. coli* is typically the indicator bacteria for freshwater beaches. It is sometimes monitored as the indicator bacteria in brackish or estuarine beaches. For example, in the Metro Vancouver area and Coast Garibaldi, *E. coli* is used as the indicator bacteria in fresh, marine, and brackish water (a mixture of Fraser River water and ocean water).<sup>93</sup>

An in-depth Metro Vancouver study confirmed that *E. coli* was a more useful predictor of the risk of gastrointestinal illness in those waters.<sup>94</sup> The *Guidelines for Canadian Recreational Water Quality* support the use of *E. coli* as the water quality indicator in certain cases:

“If it can be shown that *E. coli* can adequately demonstrate the presence of faecal contamination in marine waters, then the *E. coli* maximum limit for fresh waters may be adopted.”<sup>95</sup>

The decision to use *E. coli* as the indicator for Metro Vancouver’s waters is consistent with recreational water quality data collected for over 20 years, allowing for comparison with historical data.<sup>96</sup>

Vancouver Coastal Health tests recreational water weekly at monitored sites, and the levels of *E. coli* are expressed as a running average: a geometric mean over the most recent 30 days.

### **Beach Postings and Advisories**

When the geometric mean of 200 *E. coli* / 100 mL of water is exceeded, or in the case of a known hazard or spill, an assessment of the risk level and best approach to protect the health of

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<sup>92</sup> Vancouver Coastal Health, *Beach Water Quality*; Heather Granger, personal communication.

<sup>93</sup> Jessica Ip, personal communication, Vancouver Coastal Health Vancouver Office, August 17, 2016; Cindy Watson, personal communication, Vancouver Coastal Health, Squamish Office, November 22, 2016; Steve Chong, personal communication, Vancouver Coastal Health, Richmond Office, November 22, 2016.

<sup>94</sup> Jessica Ip, personal communication.

<sup>95</sup> Health Canada, *Guidelines, Third Edition*, 34.

<sup>96</sup> Jessica Ip, personal communication.

recreational water users will be made.<sup>97</sup>

The Medical Health Officer may then require the local government to post an advisory sign warning the public that the water is contaminated and unsafe for swimming.<sup>98</sup> As Vancouver Coastal Health follows the best practices and procedures outlined in the federal guidelines, re-sampling is often carried out.<sup>99</sup>

### Interior Health (54 beaches)

Like the other British Columbia health authorities, Interior Health monitors beaches on a weekly basis throughout the summer. Interior Health samples designated beaches from June to September. The indicator bacteria used is *E. Coli*, as the beaches within this area are inland (freshwater). One sample is collected per beach per week. The geometric mean for each beach is calculated from the 5 most recent samples.<sup>100</sup>

#### ***E. Coli* Guidelines**

- 200 *E. coli* / 100 mL – geometric mean at least 5 samples
- 400 *E. coli* / 100 mL – single sample maximum

#### **Beach Postings and Advisories**

An exceedance of the geometric mean triggers an advisory, and the beach is physically posted with a sign to alert swimmers of water quality concerns. A high single sample may also trigger an advisory; often, re-sampling is conducted to verify a high single sample value; if confirmed, a beach advisory is posted.

In addition to physically posting a beach when levels are found to be in exceedance of Health Canada guidelines, the local government (community or regional districts) may issue alerts or reports online to advise the public of water quality concerns.

While Interior Health does not track individual cases of waterborne infections such as swimmers' itch, a grouping of reports may warrant further investigation by the health unit.

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<sup>97</sup> Vancouver Coastal Health, *Pools and Beaches*, <http://www.vch.ca/public-health/environmental-health-inspections/pools-beaches>.

<sup>98</sup> Vancouver Coastal Health, *Beach Water Quality*, <http://www.vch.ca/Documents/Beach-water-quality-report-metro-Vancouver.pdf>

<sup>99</sup> Jessica Ip, personal communication.

<sup>100</sup> British Columbia, Interior Health Authority, Sample History: Sample Parameter Report, September 2016. <https://www.interiorhealth.ca/YourEnvironment/RecreationalWater/Documents/Beach-sample-results.pdf>

## Northern Health (no officially monitored beaches)

Northern Health does not routinely monitor recreational water sites or sample beaches for water quality.

Routine recreational monitoring is limited in Northern Health due to a variety of factors such as climate, resource limitations for staff, vast geography and majority of recreational sites tend to be lakes and rivers.<sup>101</sup>

Northern Health is divided into three territories: Northern Interior, North West, and North East. Recreational waters are monitored on a case-by-case basis when there is evidence to suspect that the beach water poses a risk to public health. For example, if there has been a sewage spill, or if a waterborne illness is reported following bathing at a beach, Northern Health will investigate. This evidence could include (but is not limited to):

- a. reports of a disease outbreak or illnesses of specific aetiology
- b. reports of a specific event such as a sewage spill or discharge

Interpretation of sample results follows the *Guidelines for Canadian Recreational Water Quality*.

When sampling at recreational locations occurs, Northern Health follows the federal guidelines.

### **E. Coli Guidelines**

- 200 *E. coli* / 100 mL – geometric mean at least 5 samples
- 400 *E. coli* / 100 mL – single sample maximum

### **Cyanobacteria**

Water bodies suspected to have cyanobacteria blooms are monitored according to the Health Canada Guidelines. Monitoring occurs on a case-by-case basis, and action is taken when a bloom is reported. However, few laboratories in British Columbia process blue-green algae samples. There is currently no lab in Northern Health's jurisdiction that processes cyanobacteria tests. Therefore, when Northern Health investigates blue-green algae blooms, inspections are done visually.

Like the rest of the province's health authorities, Northern Health works with other health authorities to standardize cyanobacteria monitoring and management across the province based on the federal recommendations.

- microcystin-LR not exceed 1.5 ug/L (drinking water)
- Total cyanobacteria not exceed 100,000 cells/mL and total microcystins not exceed 20 ug/

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<sup>101</sup> Neelam Hayer, personal communication, email, December 6, 2016.

L (expressed as microcystin-LR). (recreational water)

## Communications

Northern Health uses multiple communication channels to alert the public to recreational water quality issues. Northern Health has posted advisories during a blue-green algal bloom at the affected water body. Media outreach, such as radio announcements and interviews on local news stations, has also been used as a means to communicate information on an advisory.

Local community groups are also called upon to get the word out. For example, during the summer of 2016, in addition to posting advisories for several blue-green algae blooms, Northern Health contacted the community associations for several local lakes with residents residing around the lakes. The community groups shared advisories on Facebook groups or via community mailboxes.<sup>102</sup>

## Fraser Health (45 beaches)

Fraser Health monitors approximately 45 beach sites.<sup>103</sup> In Fraser Health's jurisdiction, water samples are collected at approximately 45 recreational water sites on a weekly basis during the spring and summer to determine compliance with the federal *Guidelines for Canadian Recreational Water Quality*.<sup>104</sup> There are both freshwater and marine beach under Fraser Health's jurisdiction.

Fraser Health uses *E. coli* as the indicator for both marine and freshwater beaches.<sup>105</sup>

## E. Coli Guidelines

- 200 *E. coli* / 100 mL – geometric mean (usually 5 samples)
- 400 *E. coli* / 100 mL – single sample maximum

## Cyanobacteria

In the case of cyanobacteria, Fraser Health follows the protocol for monitoring algae blooms laid out by the provincial Decision Protocols for Cyanobacterial Toxins in British Columbia Drinking Water and Recreational Water. However, the occurrence of cyanobacteria and toxic algae in the

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<sup>102</sup> Ibid.

<sup>103</sup> Fraser Health, *Recreational Water Quality Current Conditions for Beaches in Fraser Health*, 2016, Accessed December 6, 2016, [http://www.fraserhealth.ca/media/20160923\\_beachsamples.pdf](http://www.fraserhealth.ca/media/20160923_beachsamples.pdf); British Columbia Ministry of Health. *Core Public Health Functions for BC: Evidence Review - Water Quality: Recreation Water*. 2007, Accessed December 6, 2016, <http://www.health.gov.bc.ca/library/publications/year/2007/recreational-water-quality-evidence-review.pdf>

<sup>104</sup> Fraser Health, "Beach Conditions," <http://www.fraserhealth.ca/health-info/health-topics/recreational-water/beach-conditions/> (accessed March 2017).

<sup>105</sup> Ibid.

region is very low.

### **Beach Postings and Advisories**

An “unsatisfactory” condition is given when a geometric mean exceeds 200 *E. coli* bacteria / 100 mL of water and/or when a series of single sample results exceed 400 *E. coli* bacteria / 100 mL and an assessment of the beach conditions is completed by Fraser Health. Under these circumstances, swimming and primary contact activities such as surfing, water skiing, diving, and whitewater canoeing/rafting/kayaking are not recommended.<sup>106</sup>

Fraser Health recommends that beach operators post advisory signs to warn swimmers of unsatisfactory physical, chemical, or biological conditions.<sup>107</sup>

### **Island Health (Vancouver Island Health Authority) (100 beaches)**

Island Health monitors nearly 100 beaches. Island Health is split into three service delivery areas: North (20 beaches), Central (39 beaches), and South (40 beaches).

Island Health conducts sampling at beaches that are “formally recognized public recreational water bathing areas, with lands controlled by a federal, provincial, regional or municipal body/agency, which provide access to ocean, lake or river water.”<sup>108</sup> Sampling is not conducted at private beaches or “unofficial bathing areas” on public lands.<sup>109</sup>

The sampling program generally runs from May until Labour Day. The Environmental Health Officer (EHO) conducts a beach assessment for each beach.<sup>110</sup> Sampling frequency is determined once the beach is assessed based on use, historical sample results, and possible sources of contamination.<sup>111</sup> The frequencies are:

High:	Sampled weekly
Moderate:	Sampled every 2 weeks
Low:	Sampled monthly
Very Low:	Not sampled unless EHO deems necessary

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<sup>106</sup> Ibid.

<sup>107</sup> Ibid.

<sup>108</sup> Island Health, “Beach Reports,” [http://www.viha.ca/mho/recreation/beach\\_reports.htm](http://www.viha.ca/mho/recreation/beach_reports.htm) (accessed February 2017).

<sup>109</sup> Ibid.

<sup>110</sup> Ibid.

<sup>111</sup> Ibid.



### ***E. Coli* Guidelines**

- 200 *E. coli* / 100 mL – geometric mean (usually 5 samples)
- 400 *E. coli* / 100 mL – single sample maximum

Beaches are automatically posted when a sample result exceeds 1000 *E. coli* / 100 mL.

Island Health states that consideration is given to posting a beach advisory when the geometric mean exceeds 200 *E. coli* / 100 mL or when a single results exceeds 400 *E. coli* / 100 mL.<sup>112</sup> However, posting a beach advisory when samples exceed the geometric mean and/or single sample maximums are not automatic and depend on the circumstances.<sup>113</sup>

### ***Enterococci* Guidelines**

- 35 *enterococci* / 100 mL – geometric mean at least 5 samples
- 70 *enterococci* / 100 mL – single sample maximum

Beaches are automatically posted when a sample result exceeds 175 *Enterococci* / 100 mL.

Consideration is given to posting a beach advisory when the geometric mean exceeds 35 *Enterococci* / 100 mL or a single results exceeds 70 *Enterococci* / 100 mL.<sup>114</sup>

### **First Nations Health Authority**

The First Nations Health Authority (FNHA) provides health services to First Nations in British Columbia. In 2013, FNIHB transferred responsibility of health related programs, services, and responsibilities to FNHA to allow for greater First Nations' control.<sup>115</sup>

The FNHA follows the Canadian Recreational Water Quality Guidelines for marine and freshwater recreational sites. In all cases of recreational water quality monitoring, FNHA provides investigation, advice, and recommendations to First Nations governments (Chiefs and Councils). FNHA works collaboratively with First Nations governments to address water quality issues. Related activities may include assisting with communication of contamination to the public/residents.

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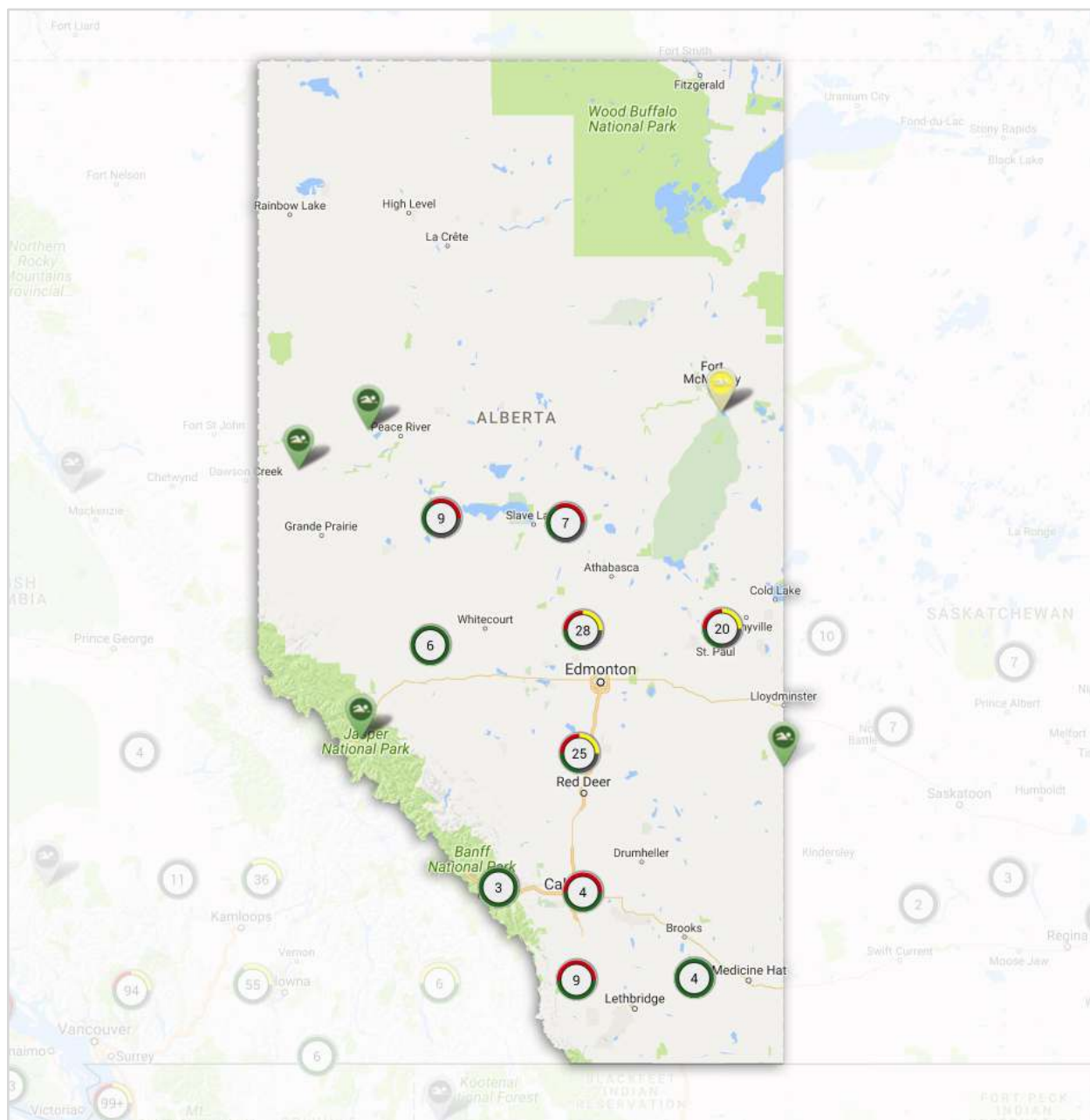
<sup>112</sup> Ibid.

<sup>113</sup> Ibid.

<sup>114</sup> Ibid.

<sup>115</sup> First Nations Health Authority, "BC First Nations Health Authority Marks Historic Transfer of Services from Health Canada," <http://www.fnha.ca/about/news-and-events/news/bc-first-nations-health-authority-marks-historic-transfer-of-services-from-health-canada> (accessed January 2017).

## Alberta



All of Alberta's recreational water sites are inland and are therefore all freshwater. In 2016, Alberta Health Services (AHS), the agency that delivers health services in Alberta, monitored a total of 56 freshwater beaches across the province's five zones—Calgary, Central, Edmonton, North, and South—for microbiological and/or cyanobacteria parameters. Sites are monitored during the open water season, typically June to September. Monitoring is typically conducted on a weekly basis. Blue-Green algae advisories typically remain in effect until November. In addition to AHS monitoring,

approximately 200 beaches had varying levels of sampling for faecal coliforms completed by their own operators.

Alberta follows the federal *Guidelines for Canadian Recreational Water Quality* for cyanobacteria, but follows the historical set of standards for faecal coliforms, which were originally outlined in General Nuisance and General Sanitation Regulation, Part 3: Public Beaches under the provincial Public Health Act. Faecal coliforms are used as the indicator bacteria when testing bathing beaches for suitability for swimming.

Alberta is currently developing the Alberta Recreational Water Management Protocol. The purpose of the non-regulatory protocol is to establish recreational water quality standards to protect the public from all health risks (bacterial, chemical, and physical). The protocol also aims to provide “clear and comprehensive guidelines to proactively assess and manage the public health risks associated with recreational waters throughout Alberta.”<sup>116</sup>

The current Nuisance and General Sanitation Regulations were revised in 2014, and Section 3 Public Beaches was rescinded as it was “outdated and no longer reflective of the current management practices or water quality guidelines recognized to be protective of public health.” Once published, the new protocol will clarify how recreational waters are managed in Alberta, set water quality standards, and describe the roles of the provincial agencies and operators in overseeing monitored swimming sites. In the meantime, the province and AHS are continuing to use the faecal coliform standards. The Protocol is expected to be completed in 2017.

### ***Parameters for monitoring recreational water quality***

#### **Indicator Bacteria**

Alberta continues to apply Section 16 of the previous regulation. In order to be considered safe for swimming, a beach must meet the following criteria:

- Two consecutive values below 400 faecal coliform CFU / 100 mL; and
- Geometric mean below 200 faecal coliform CFU / 100 mL taken over a 30-day period

Part of the investigation after receiving unsatisfactory results includes a site assessment, if warranted, to determine potential exposures or causes. This will also allow for a risk assessment, including necessity for additional sampling.

Typically, when water fails to meet the criteria, signs are posted at the recreational site and an

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<sup>116</sup> Joan Yee, personal communication, email, August 29, 2016.

advisory is posted on the AHS website (<http://www.albertahealthservices.ca/1926.asp>). AHS always notifies Alberta Health, which distributes the information to a variety of organizations, including to Alberta's First Nations and Inuit Health Branch.

## Cyanobacteria

Alberta Health Services has a blue-green algae/cyanobacteria monitoring program in place. Approximately 50 beaches in Alberta are proactively monitored on a scheduled basis over the course of the swim season for cyanobacteria and microcystin. This surveillance includes visual observations and cell count and microcystin monitoring. Beaches and other recreational water spots that are not part of the regular monitoring program are investigated and responded to on a demand/complaint basis.

Water bodies suspected to have cyanobacterial blooms are monitored according to the Guidelines for *Canadian Recreational Water Quality*.<sup>117</sup>

- Total cyanobacteria not exceed 100,000 cells/mL and total microcystins not exceed 20 ug/L (expressed as microcystin-LR). (recreational water)

In the case of cyanobacteria and/or microcystin exceedance, AHS posts an advisory on its website<sup>118</sup> and social media accounts and posts physical signage with educational messaging at affected swim sites.<sup>119</sup> AHS notifies Alberta Health, which distributes the information to a variety of organizations, including to Alberta's First Nations and Inuit Health Branch and Alberta Environment and Parks. Where indicated, follow-up with potential affected drinking water systems from the blue-green algae advisory is completed, including any indigenous communities through FNIHB's EHOs.

## *Recreational Water Quality in Indigenous Communities in Alberta*

As in the rest of Canada, First Nations reserves in Alberta fall under federal jurisdiction. There are over 140 First Nations reserves in Alberta. The First Nations and Inuit Health Branch (FNIHB) is responsible for public health on reserves. Of the water bodies that AHS monitored in 2016, 7 border or are within 1km of a First Nation reserve.<sup>120</sup> There may be several beaches or swim spots tested on a single lake.

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<sup>117</sup> Ibid.

<sup>118</sup> Alberta, "Health Advisories," Alberta Health Services, <https://myhealth.alberta.ca/alerts/Pages/Alberta-Health-Advisories.aspx> (accessed December 2016).

<sup>119</sup> Jessica Popadynetz, personal communication, email, June 19, 2015.

<sup>120</sup> Joan Yee, personal communication, phone, December 14, 2016.

In the case of an advisory at a recreational water site monitored by AHS for a bacterial exceedance or for blue-green algae, AHS alerts Alberta Health and notifies the public on its website. Alberta Health distributes the information about the advisory as well. First Nations and Inuit Health Branch Alberta Region (FNIHB) also receive the alert and provide additional notices to affected First Nations communities.<sup>121</sup>

Some popular recreational water sites, such as Pigeon Lake, are on or near reserves. In these cases, there is increased collaboration and dialogue between the respective health agencies. Based on the limited number of beaches and current program mandates and priorities, recreational water quality monitoring on reserves is on an as-needed basis. Drinking water is sampled regularly on reserves, and action is taken if there is a concern that contaminants could affect recreational waters.

Monitoring cyanobacteria on reserve in Alberta follows the provincial process. In fact, FNIHB contributed to the development of the provincial cyanobacteria program. FNIHB Alberta follows the provincial cyanobacteria investigation and notification process.<sup>122</sup>

As is the case in other provinces, there is no formal routine recreational water quality program for indigenous communities in Alberta. Often, First Nations in Alberta hire their own staff to monitor recreational water quality on reserve. There are few on-reserve beaches in Alberta. The number of bathing beaches and recreational water areas on reserve in Alberta is unknown.

There is a lot of cooperation and coordination between FNIHB and AHS when it comes to recreational water quality. Just as AHS alerts FNIHB to recreational water quality issues affecting water bodies near First Nations communities, FNIHB includes AHS in all communications and recreational water alerts for on-reserve issues.<sup>123</sup> As much as possible, activities between AHS and FNIHB are coordinated.

Other scenarios for monitoring recreational water quality on reserve in Alberta include the monitoring of waters that are at risk due to development. For example, Environment Canada monitors water in the Athabasca sub-basin in north-eastern Alberta. The Athabasca sub-basin is the site of major oil and gas development projects and forestry projects. Monitoring of water quality is the federal government's responsibility, as outlined in the CEAA. "There is also a responsibility for

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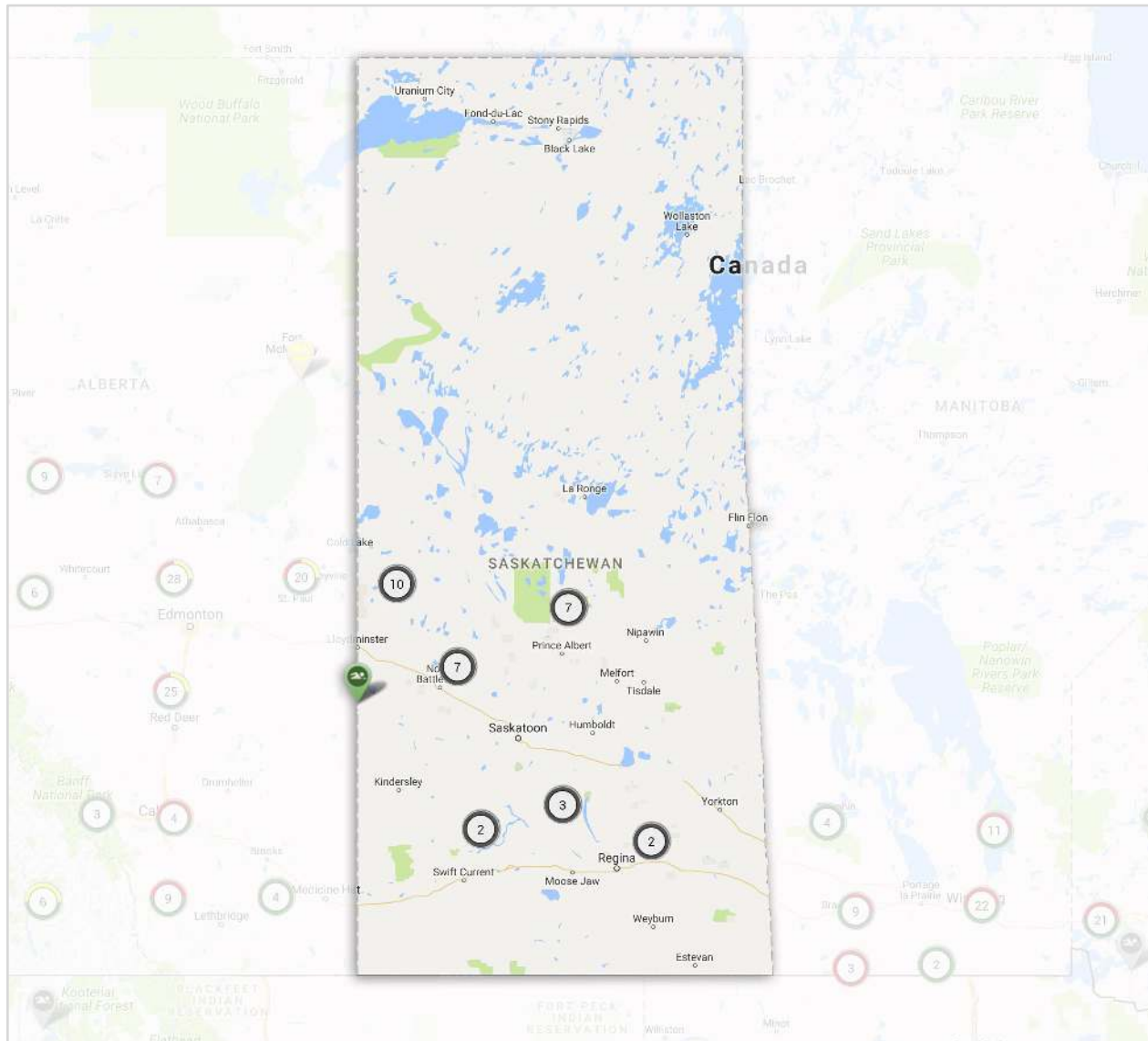
<sup>121</sup> Ibid.

<sup>122</sup> Simon Sihota, personal communication, phone, December 21, 2016.

<sup>123</sup> Ibid.

monitoring of waters from provincial regulators such as the Alberta Energy Regulator (AER). This may include monitoring on or near the indigenous community.”<sup>124</sup>

## Saskatchewan



Currently, Saskatchewan does not have an official beach water quality monitoring program for its

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<sup>124</sup> Simon Sihota, personal communication, email, February 13, 2017.

public beaches.<sup>125</sup> The province carries out some monitoring of beach sites. There are approximately 70 beaches monitored; however, the public does not have access to test results. Beach monitoring results are published when sampling reveals that there are water quality concerns.<sup>126</sup>

### **Healthy Beach Program**

In recent years, the Saskatchewan Ministry of Health has been working with Regional Health Authorities and non-governmental organizations to implement a beach monitoring program.<sup>127</sup> To date, a registry of approximately 70 public beaches in the province has been created and work is ongoing to determine which beaches will have weekly, monthly, or seasonal monitoring.<sup>128</sup> Once the program is underway, online recreational water quality information (e.g., a public website that lists all monitored beaches and water quality indicators and results) may be available.<sup>129</sup>

### ***Parameters for monitoring recreational water quality***

The Ministry of Health will sometimes issue advisories when monitoring information indicates water quality concerns.<sup>130</sup> When sampling of recreational (beach) water areas shows levels of microcystin or *E. coli* that exceed the *Guidelines for Canadian Recreational Water Quality*, the regional health authority will use a risk-based approach to determine if an advisory will be issued.<sup>131</sup> (Risk considerations include, but are not limited to, wind direction, wave action, and ambient temperature.<sup>132</sup>)

Health officials notify those responsible for the recreational water area and signage is posted along the beach area. Additionally, if the advisory impacts a large watershed area or a popular beach, a news release may be issued.<sup>133</sup>

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<sup>125</sup> Saskatchewan, "Swimming Pools and Recreational Water," Environment, Public Health, & Safety, <https://www.saskatchewan.ca/residents/environment-public-health-and-safety/environmental-health/swimming-pools-and-recreational-water> (accessed July 2016); Tim Macaulay, personal communication, phone, July 8, 2016.

<sup>126</sup> Tim Macaulay, personal communication.

<sup>127</sup> Ibid.

<sup>128</sup> Ibid.

<sup>129</sup> Ibid.

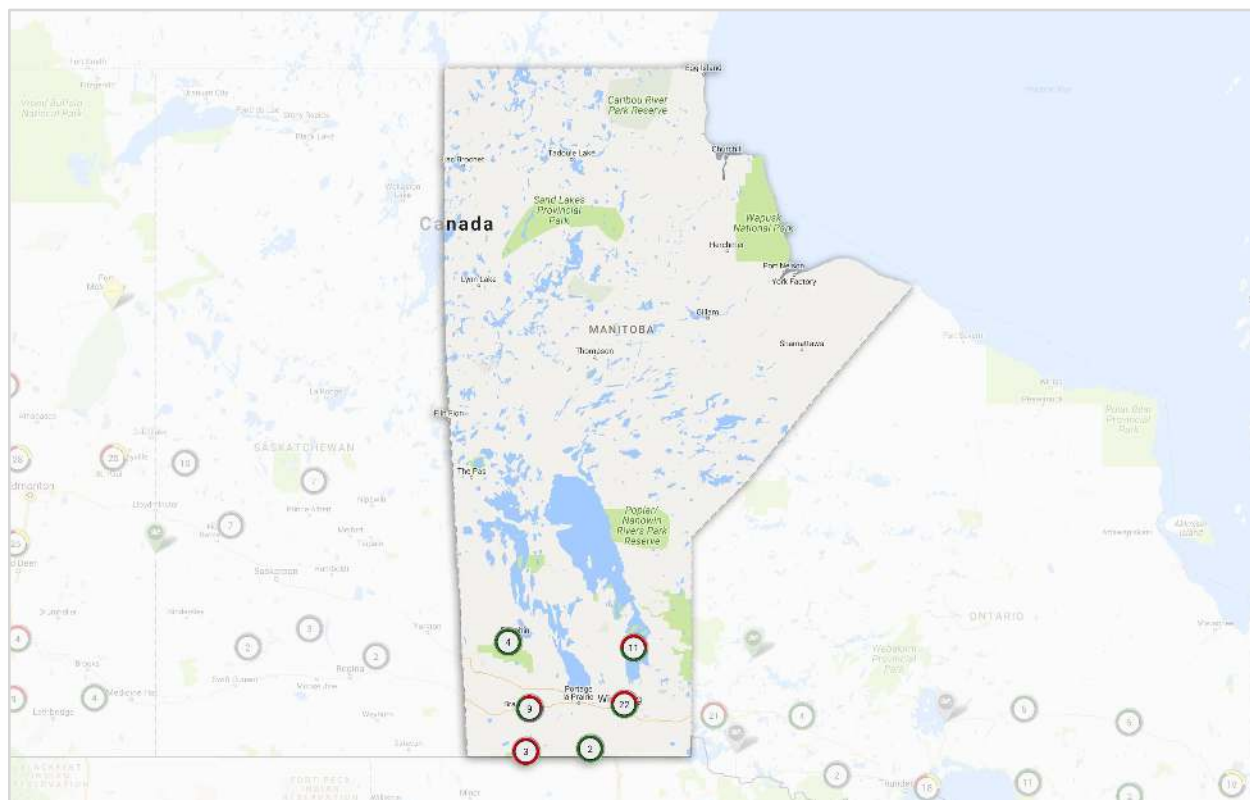
<sup>130</sup> Ibid.

<sup>131</sup> Tyler McMurchy, personal communication, August 30, 2016.

<sup>132</sup> Ibid.

<sup>133</sup> Ibid.

# Manitoba



## *Clean Beaches Program*

Manitoba Sustainable Development and Manitoba Health, Seniors, and Active Living collaboratively developed the Provincial Clean Beaches Program. They work in cooperation to monitor over 60 beaches across the province during the swimming season (June to August) to assess the risk of illness to recreational water users.<sup>134</sup>

Beach monitoring frequency varies based on recreational intensity and historical bacteria data, and can be twice a week, weekly, bi-weekly, or monthly.<sup>135</sup>

About half of the monitored beaches in the province are tested monthly. Another 8 are monitored bi-weekly. Typically, the approximately 20 beaches on Lake Winnipeg are monitored once a week.

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<sup>134</sup> Manitoba, "Manitoba Beaches," Manitoba Sustainable Development, <http://www.gov.mb.ca/sd/waterstewardship/quality/beaches.html> (accessed January 2017); Cassie McLean, personal communication, phone, August 24, 2016.

<sup>135</sup> Manitoba, "Clean Beaches Program," Water Stewardship Division, [https://www.gov.mb.ca/waterstewardship/water\\_quality/lake\\_winnipeg/clean\\_beaches.html](https://www.gov.mb.ca/waterstewardship/water_quality/lake_winnipeg/clean_beaches.html) (accessed January 2017)



Gimli Beach and West Grand Beach on Lake Winnipeg are monitored more frequently at twice a week.<sup>136</sup>

The *Manitoba Water Quality Standards, Objectives and Guidelines* set the primary recreation surface water objectives for *E. coli*, cyanobacteria, and microcystin during the swimming season.

### ***Parameters for monitoring recreational water quality***

#### ***E. coli***

- 200 *E. coli* / 100 mL – geometric mean
- 400 *E. coli* / 100 mL – single sample maximum

These objectives are similar to the federal *Guidelines for Canadian Recreational Water Quality*. The geometric mean for each beach is calculated from multiple samples collected across the swimming area on a single day.<sup>137</sup> The number of samples collected per beach varies. Five samples are collected at larger beaches, while three samples are collected at smaller beaches.<sup>138</sup>

Any exceedance of the recreational objective for either the geometric mean (maximum 200 *E. coli* / 100 mL) or a single sample (maximum 400 *E. coli* / 100 mL) triggers re-sampling. During re-sampling, the number of replicated samples is doubled to 6 or 10 samples per beach.<sup>139</sup> If the beach continues to exceed the recreation objective, re-sample replicates may be doubled again to assist in determining the source of contamination. Meanwhile, the beach will be posted with a yellow beach advisory sign, and the website will display the advisory both on the advisory page and on the map under the individual beach.<sup>140</sup>

Due to extensive studies conducted on Lake Winnipeg, the advisory signs for the Lake include an additional bullet point advising bathers to “minimize water contact if lake levels are high and strong winds are blowing from the north,” since large numbers of *E. coli* are present in the wet sand of beaches. During some periods of high winds, when water levels are rising in the south basin, these bacteria can be washed out of the sand and into the swimming area of the lake. These advisory

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<sup>136</sup> Cassie McLean, personal communication.

<sup>137</sup> Ibid.

<sup>138</sup> Ibid.

<sup>139</sup> Ibid.

<sup>140</sup> Ibid.

signs remain posted for the duration of the season.<sup>141</sup>

## Cyanobacteria

Manitoba monitors the 60 beaches in the Clean Beaches Program for cyanobacteria and toxic algae. Algae samples are collected when an algal bloom is present. Manitoba also monitors blooms reported at locations that are not part of the program. If the cyanobacterial cell count exceeds 100,000 cells/mL, a first level algae advisory sign is posted at the beach to warn bathers to avoid swimming or contact with water.<sup>142</sup> The first level algae advisory sign remains posted at a beach for the remainder of the season.<sup>143,144</sup>

If the microcystin concentrations exceed 20 µg/L, a second level algae toxin advisory sign is posted at the beach indicating that drinking, swimming, or other contact with the water is not recommended. The second level algae advisory sign remains posted at the beach until concentrations return to acceptable levels, below 20 µg/L, at which point the sign is replaced with a first level algae advisory sign that remains posted for the remainder of the season.<sup>145</sup>

## Additional Parameters

Manitoba monitors for swimmer's itch each season, with confirmed water bodies and dates posted on the Manitoba Sustainable Development website.<sup>146</sup> This program relies on reporting from the public through a swimmer's itch reporting form, which is circulated to health care professionals and beach operators at the beginning of each season.<sup>147</sup> Bathes can also report swimmer's itch directly to Manitoba Sustainable Development at [manitoba.ca/beaches](http://manitoba.ca/beaches).

## Communication, beach postings, and advisories

Samples are processed and analyzed at an analytical lab contracted by the Manitoba Government. Sample analysis results are received 24 hours from the time of sample submission to the analytical

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<sup>141</sup> Dwight Williamson et al. *Principal Factors Affecting Escherichia Coli at Lake Winnipeg Beaches, Manitoba, Canada Interim Report*, Manitoba Water Stewardship Report No. 2004-01, City, January 29, 2004, Accessed November 2016. [https://www.gov.mb.ca/waterstewardship/water\\_quality/lkwpbg\\_beach\\_report\\_interim-040129.pdf](https://www.gov.mb.ca/waterstewardship/water_quality/lkwpbg_beach_report_interim-040129.pdf); C. McLean, personal communication, 4 January 2017.

<sup>142</sup> Manitoba, "Clean Beaches Program."

<sup>143</sup> Ibid.

<sup>144</sup> Ibid.

<sup>145</sup> Ibid.

<sup>146</sup> Cassie McLean, personal communication.

<sup>147</sup> Ibid.

laboratory.<sup>148</sup>

In addition to physically posting a beach when levels are found exceed the provincial guidelines, the Manitoba Sustainable Development website maps the beaches in the province and allows beachgoers to access the latest sample results.<sup>149</sup> During the bathing season, a weekly beach conditions summary is issued and is made available on the beach website, and the Manitoba Government Twitter feed provides weekly updates and advises the public to check for advisory signs at beaches and to review the online report.

### ***Recreational Water Quality in Indigenous Communities in Manitoba***

As in other provinces, the FNIHB is responsible for delivering health services to indigenous reserves in Manitoba. Recreational water quality monitoring does take place on some indigenous reserves in Manitoba. As in other provinces, typically First Nations Chiefs and Councils indicate an interest or a need for recreational water quality monitoring at on-reserve beaches or recreational water sites. EHOs from FNIHB's Environmental Public Health program support this initiative with equipment and training. Certain indigenous communities use their own on-reserve drinking water labs to test recreational water for indicator bacteria. On-reserve recreational water quality monitoring programs are funded federally.

According to Tim Ness, Senior EHO for Health Canada, EHOs may be consulted for information and advice on issues of safe recreational water use. EHOs may consult Manitoba's Clean Beaches Program for recreational water quality monitoring data when applicable. EHOs will conduct site inspections of designated beaches upon request.<sup>150</sup>

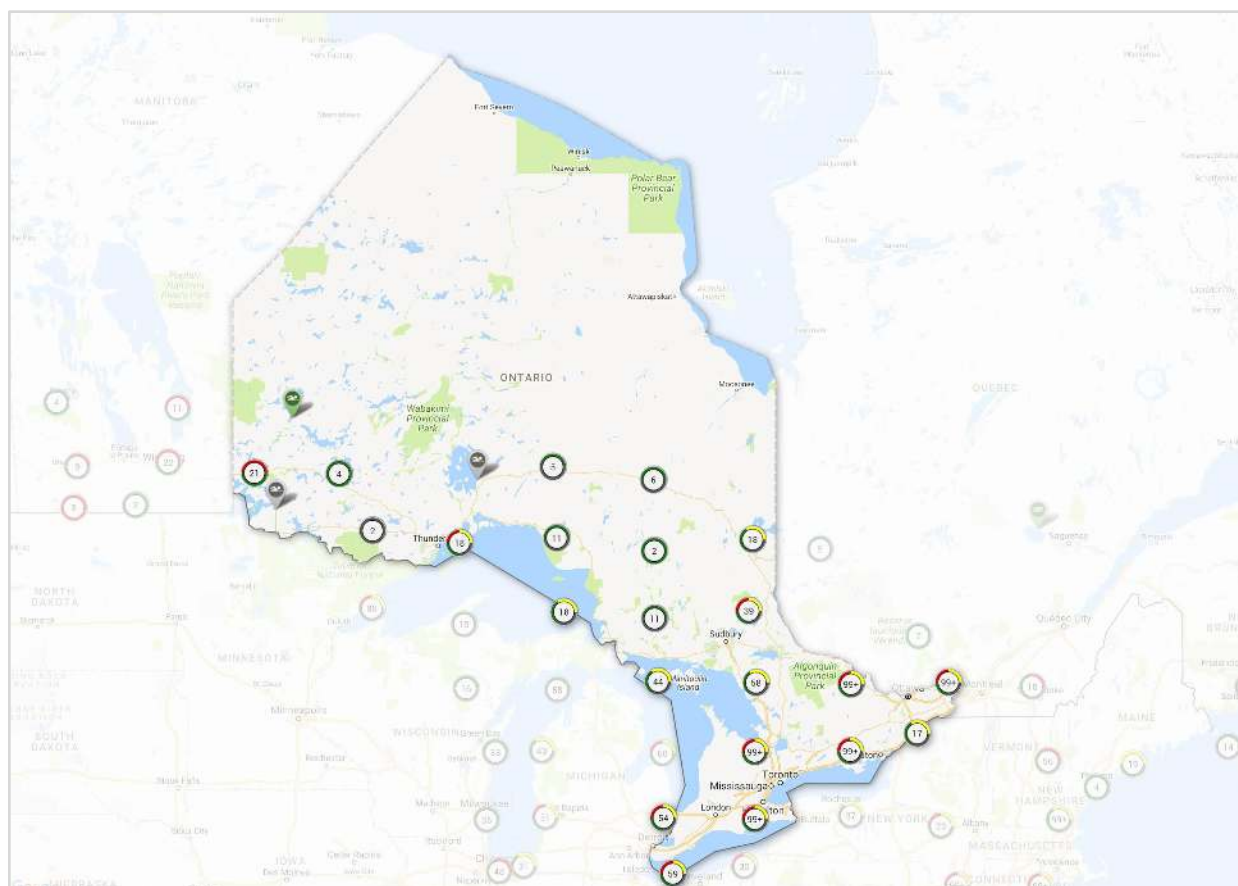
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<sup>148</sup> Ibid. email, 8 June 2017.

<sup>149</sup> Ibid.

<sup>150</sup> Tim Ness, personal communication, phone and email, January 3, 2017

# Ontario



Ontario has around 300 Great Lakes beaches and an additional 550 inland beaches.<sup>151</sup> Beaches are monitored according to the Ontario Recreational Water Protocol (2016). Municipalities and public health units monitor most of the province's beaches, while Ontario Parks monitors provincial park beaches. Beaches are generally sampled weekly from June to Labour Day.

In Ontario, recreational water quality requirements are established by the Ontario Public Health Standards (OPHS).<sup>152</sup>

The Ministry of Health and Long Term Care, under the Health Protection and Promotion Act (HPPA), publishes the OPHS protocols and standards. The Recreational Water Protocol (2016) is one of 27

<sup>151</sup> Albert Simhon, “Health Canada, Ontario, USEPA Recreational Water Guidelines” (GLBA Conference, International Beach 101 Workshop, Ontario Ministry of the Environment, Toronto, November 12, 2014).

<sup>152</sup> Ontario, “Ontario Public Health Standards”, Ministry of Health & Long-term Care, [http://health.gov.on.ca/en/pro/programs/publichealth/oph\\_standards/default.aspx](http://health.gov.on.ca/en/pro/programs/publichealth/oph_standards/default.aspx) (accessed November 1, 2016).

mandatory health programs and services in Ontario, and it provides direction to boards of health on how to deliver “local, comprehensive recreational water programs.”<sup>153</sup>

The overarching purpose of the Recreational Water Protocol is to “assist in the prevention and reduction of waterborne illness and injury related to recreational water use at public beaches.”<sup>154</sup> It specifies the minimum and mandatory public health programs and services related to its purpose.

Requirements in the Protocol are related to recreational water facilities, camp waterfront, and public beaches. In the latest version of the Recreational Water Protocol (2016) public beaches are defined as:

Any public bathing area owned/operated by a municipality to which the general public has access, and where there is reason to believe that there is recreational use of the water (e.g., beach signage, sectioned off swimming area, water safety/rescue equipment, lifeguard chairs, etc.), which may result in waterborne illness or injury as determined by the local medical officer of health.<sup>155</sup>

The Standards related to the Recreational Water Protocol is named “Safe Water” standard.

Safe Water requirements are as follows:

Requirement #1: The board of health shall report Safe Water Program data elements in accordance with the Drinking Water Protocol, 2008 (or as current); and the Recreational Water Protocol, 2008 (or as current).

Requirement #3: The board of health shall conduct surveillance of public beaches and public beach water illnesses of public health importance, their associated risk factors, and emerging trends in accordance with the Recreational Water Protocol, 2008 (or as current).

Requirement #5: The board of health shall conduct surveillance of recreational water facilities in accordance with the Recreational Water Protocol, 2008 (or as current).

Requirement #9: The board of health shall provide education and training for owner/operators of

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<sup>153</sup> Ontario, *Recreational Water Protocol, 2016*, Ministry of Health and Long-Term Care, Toronto, May 2016, Accessed August 8, 2016. [http://www.health.gov.on.ca/en/pro/programs/publichealth/oph\\_standards/docs/recreational\\_water.pdf](http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/recreational_water.pdf)

<sup>154</sup> Ibid.

<sup>155</sup> Ontario, *Recreational Water Protocol, 2016*, Ministry of Health and Long-Term Care, Toronto, May 2016, Accessed November 15, 2016. [http://www.health.gov.on.ca/en/pro/programs/publichealth/oph\\_standards/docs/recreational\\_water.pdf](http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/recreational_water.pdf), 3.

recreational water facilities in accordance with the Recreational Water Protocol, 2008 (or as current).

Requirement #10: The board of health shall ensure that the medical officer of health or designate is available on a 24/7 basis to receive reports of and respond to:

- Adverse events related to safe water, such as reports of adverse drinking water on drinking-water systems governed under the Health Protection and Promotion Act or the Safe Drinking Water Act;
- Reports of water-borne illnesses or outbreaks;
- Safe water issues arising from floods, fires, power outages, or other situations that may affect water safety; and
- Safe water issues relating to recreational water use including public beaches in accordance with the Health Protection and Promotion Act; the Drinking Water Protocol, 2008 (or as current); the Infectious Diseases Protocol, 2008 (or as current); the Public Health Emergency Preparedness Protocol, 2008 (or as current); and the Recreational Water Protocol, 2008 (or as current).

Requirement #13: The board of health shall reduce risks of public beach use by implementing a beach management program in accordance with the Recreational Water Protocol, 2008 (or as current).

Requirement #14: The board of health shall reduce the risks of recreational water facility use by implementing a management program in accordance with the Recreational Water Protocol, 2008 (or as current).

Investigation and response to adverse events and complaints at public beaches, communication strategies for the public, promoting safe use and operation of beaches, implementation of beach management programs, and response to safe water issues are outlined in the Protocol.<sup>156</sup>

Implementation of the standards and protocols that the Recreational Water Protocol (2016) requires in relation to public beaches are supported by an additional document: Beach Management Guidance Document (2014).<sup>157</sup>

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<sup>156</sup> Leeds, Grenville & Lanark District Health Unit, *Beach Management Protocol - Orientation Manual*, October 2008. Accessed August 8, 2016. [http://www.healthunit.org/aboutus/boh/orientation/beach\\_management.pdf](http://www.healthunit.org/aboutus/boh/orientation/beach_management.pdf).

<sup>157</sup> Ontario, *Beach Management Guidance Document, 2014*. Ministry of Health and Long-Term Care, Toronto, Accessed November 1, 2016. [http://www.health.gov.on.ca/en/pro/programs/publichealth/oph\\_standards/docs/guidance/guide\\_beach.pdf](http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/guidance/guide_beach.pdf)

The stated goal of surface water quality management in Ontario's Provincial Water Quality Objectives (1994) is "to ensure that the surface waters of the Province are of a quality which is satisfactory for aquatic life and recreation."<sup>158</sup> The PWQO are science-based, but are not regulatory instruments (i.e., they do not have the force of law).<sup>159</sup>

The rationale for recreational PWQOs is that "the use of water for swimming, bathing, and other recreational activities requiring immersion of the user should not cause disease in the human user ... or irritation or to loss of enjoyment of the water."<sup>160</sup>

### ***Parameters for monitoring recreational water quality***

#### **Indicator Bacteria**

Ontario observes a more stringent geometric mean for *E. coli* bacteria in recreational waters than the federal recommendations, though there is no single sample maximum in the Ontario standards. Beaches are generally posted when the geometric mean of 5 samples within a 30-day period exceeds 100 *E. coli* / 100 mL of water. Several health units also re-sample after posting a beach (for example Ontario Provincial Parks, Peel, Sudbury, Kingston, and Ottawa).

With these standards, it is estimated that about 7 swimmers per 1000 (0.7%) are at risk of gastrointestinal illness.<sup>161</sup>

Since 1994, *E. coli* has been recommended as the indicator bacteria for all compliance and monitoring of recreational waters in Canada. However, some health units in Ontario continue to monitor faecal and/or total coliform in order to stay consistent with historical data and certain former objectives of Ontario (PWQO):

As a benchmark for the long term monitoring results, the former objectives for fecal coliforms and total coliforms are referenced for your information. For fecal coliforms the objective was a 100 counts per 100 ml (based on a geometric mean density for a series of water samples). For total coliforms the objective was 1000 counts per 100 ml (based

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<sup>158</sup> Ontario, "Water Management: Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy," Ministry of Environment and Energy, July 1994, <https://www.ontario.ca/page/water-management-policies-guidelines-provincial-water-quality-objectives> (accessed January 2017).

<sup>159</sup> Albert Simhon, "Health Canada, Ontario, USEPA Recreational Water Guidelines."

<sup>160</sup> Ontario. "Water Management."

<sup>161</sup> Ontario, *Scientific Criteria for Microbiological Standards for Recreational Waters*. Ministry of the Environment, Hazardous Contaminants and Standards Branch, (city, February 1984), 17..

on a geometric mean density for a series of water samples).<sup>162</sup>

## Cyanobacteria

Ontario has a very comprehensive plan for blue-green algae in drinking water. There is, however, no cyanobacteria monitoring plan at the provincial level in Ontario for recreational water quality. Some municipalities have a formal monitoring plan. In the case of reported blooms in Ontario, the Ministry of the Environment and Climate Change (MOECC), the Ministry of Natural Resources (MNR), the Conservation Authority, and the local municipality work together to investigate and manage the cyanobacteria. The province recommends issuing an advisory to the public after a visual confirmation. Beach closures are recommended when toxins are present and confirmed by laboratory tests.<sup>163</sup> Action is taken when levels reach those recommended in the *Guidelines for Canadian Recreational Water Quality*.

## Cyanobacteria

- 100,000 cyanobacteria cells / mL

## Microcystin

- 20 µg/L

## *Recreational Water Quality in Indigenous Communities in Ontario*

As in other provinces, the FNIHB is responsible for delivering health services to indigenous reserves in Ontario.

There is recreational water quality monitoring on some First Nations reserves in Ontario. However, it is not managed the same way in each community.

Typically, a First Nations Chief and Council indicate an interest or a need for recreational water quality monitoring at an on-reserve beach or an untreated swim spot. EHOs from FNIHB's Environmental Public Health program support this initiative with equipment and training.<sup>164</sup> On-reserve recreational water quality monitoring programs are funded federally.<sup>165</sup>

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<sup>162</sup> Ontario. "Water Management."

<sup>163</sup> Ontario, "Blue-Green Algae," Ministry of the Environment and Climate Change, <https://www.ontario.ca/page/blue-green-algae> (accessed December 12, 2016); Ontario, *Beach Management Guidance*.

<sup>164</sup> Shaun Mackie, personal communication, location, December 21, 2016..

<sup>165</sup> Canada, "First Nations and Inuit Health, Environmental Public Health."



Certain indigenous communities use their own on-reserve drinking water labs to test recreational water for indicator bacteria. Samples are also sometimes sent to provincial labs for processing. Most reserves that do not have access to provincial or contracted labs have an on-site drinking water lab.

On-reserve monitoring programs usually follow the federal guidelines rather than Ontario's standards for recreational water quality.

### ***Recreational Water Quality monitoring in Ontario: Case studies***

#### **Kingston**

Kingston, Ontario, like Toronto, Ottawa, Vancouver, Victoria and other older cities in Canada, relies on a combined sewer system. Stormwater and sewage combine during wet weather and raw sewage flows into nearby water. When this happens, bacteria levels soar and water does not meet government guidelines for public health or environmental protection. Water quality remains poor for about 48 hours after an overflow. However, few municipalities alert the public when a combined sewer overflow is happening, or happened recently, even though the quality of their recreational waters have been compromised with untreated sewage.

Utilities Kingston unveiled a new real-time sewer monitoring system: "Know Before You Go". This is a first in Canada. The system was made live in spring of 2017. The system alerts residents when untreated sewage overflows from waterfront pipes into Lake Ontario. It uses technology developed by Utilities Kingston to meet the needs of people who swim or boat in the city. The system lets the public know when a CSO is happening, as well as provides a warning if a CSO happened within the past 48 hours.

#### **Toronto**

Toronto's 11 official beaches are tested on a daily basis during the summer months. Beach advisories are issued when the previous day's test results exceed the provincial guideline of 100 *E. coli* / 100 mL of water.

The public can access test results on the Toronto Beaches website, and an open data feed is also available. Beaches are posted with water quality information.

#### **Ontario Parks Beaches**

Swimming areas at Ontario's Provincial Parks are monitored and managed by the Ministry of Natural Resources. There are over 150 monitored Ontario Parks beaches. The beaches are monitored on either a weekly or monthly basis, or they are unmonitored. Monitoring frequency at

Ontario Parks beaches is determined based on their popularity and remoteness.

### Sudbury and District Health Unit - Sewage Alerts and Blue-Green Algae

In 2014, the city of Greater Sudbury began issuing public alerts in the case of sewage bypasses and wastewater overflows.<sup>166</sup> The move is meant to help protect public health by letting residents know when their water bodies have been contaminated by sewage.

Sudbury and District Health Unit also works with the provincial Ministry of the Environment to monitor blue-green algae at beaches for public bathing. Upon receiving a report of algae in recreational water, a health inspector from the Ministry of the Environment or from the Sudbury and District Health Unit will conduct a site visit for visual confirmation.<sup>167</sup>

If the presence of cyanobacteria is confirmed, the beach will be posted immediately with a caution status advisory warning bathers that “Blue-green algal blooms have been observed.” This information is also communicated online on the health unit’s Beach Water Testing Results page.

Algal (cyanobacteria) blooms are often readily apparent from visual inspection; however, the Health Unit will often confirm by testing for cyanobacteria (100,000 cells/ mL) and the algal toxin microcystin (0.5 µg/L).

Beaches are not usually physically closed unless there is an identified health hazard, such as a chemical spill or a high exceedance of water quality standards (e.g., *E. coli* levels are high above the provincially prescribed standard of 100 *E. coli* / 100 mL of water).<sup>168</sup>

Although the Sudbury and District Health Unit does not have statistics pertaining to illnesses acquired from recreational water bodies, laboratories are required to report any confirmed case of reportable diseases, such as giardiasis, cryptosporidiosis, and *E. coli*. The Sudbury and District Health Unit will then follow up to determine potential causes of illness. Reports of illness are tracked locally and provincially to determine clusters or potential outbreaks, which would be investigated further.<sup>169</sup>

The health unit’s role with swimmer’s itch is solely educational, as they do not conduct routine

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<sup>166</sup> City of Greater Sudbury, “Sewer and Water, Release Alerts,” <http://www.greatersudbury.ca/living/sewer-and-water/release-alert/sewer-bypass-alert-notification/> (accessed March 2017).

<sup>167</sup> Ashley DeRocchis, personal communication, August 30, 2016.

<sup>168</sup> Sudbury and District Health Unit, “Beach Water Testing: Frequently Asked Questions,” <https://www.sdhu.com/health-topics-programs/water/beaches-splash-pads-pools-spas/beach-water-testing-frequently-asked-questions> (accessed August 2016); Ashley DeRocchis, personal communication.

<sup>169</sup> Ashley DeRocchis, personal communication.

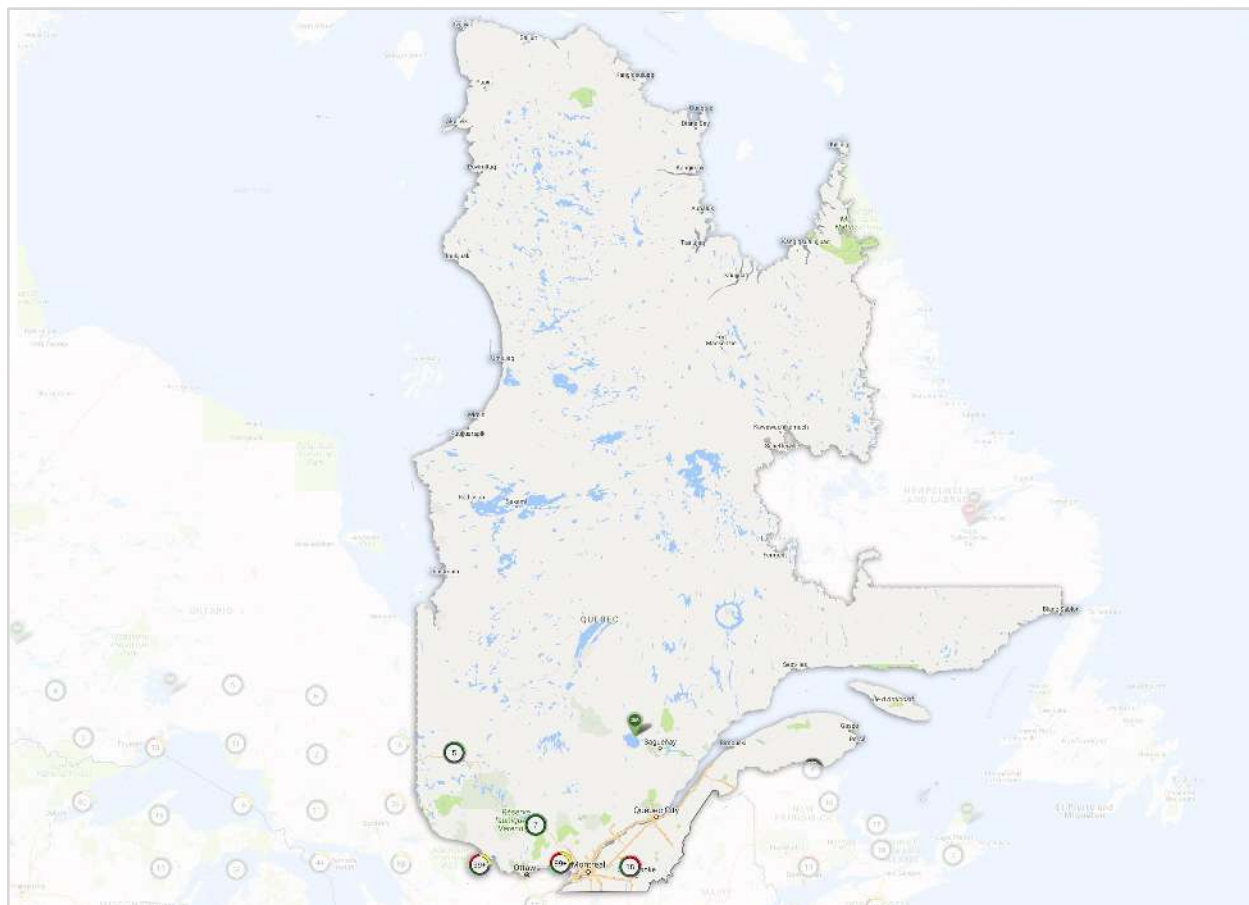
surveillance of swimmer's itch.<sup>170</sup>

The Sudbury and District Health Unit works closely with the City of Greater Sudbury to provide education on health matters related to recreational water use. Lifeguards are provided with education about beach water sampling and blue-green algae prior to the swimming season.

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<sup>170</sup> Ibid.

## Québec



There are about 400 public beaches in the province of Québec. The Ministry of Sustainable Development, Environment, and Action Against Climate Change (Ministère du développement durable, de l'environnement, et de la lutte contre les changements climatiques or MDDELCC) monitors approximately 345 of these beaches through its Environnement-Plage program.

The Québec beaches in the Environnement-Plage monitoring program are listed under 17 regions. Monitoring occurs from mid-June to the end of August. Certain municipalities and beach operators provide additional sampling data.<sup>171</sup>

Recreational water quality guidelines and beach supervision requirements in the province of Québec are legally defined in the Environmental Quality Act, Article 83 (*Loi sur la qualité de l'environnement*) and Regulation respecting safety in public baths (*Règlement sur la sécurité dans*

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<sup>171</sup> Québec, Programme Environnement-Plage, accessed 19 October 2016, translated by Gabrielle Parent-Doliner, <http://www.mddelcc.gouv.qc.ca/programmes/env-plage/index.htm>

les bain publics).<sup>172, 173</sup>

In general, beaches are sampled at least 2 to 5 times during the swimming season, depending on their rating. Beaches are given a rating (A to D) depending on results from the previous year. Beaches with an A rating are sampled at least twice the following summer. Beaches with a B rating are sampled at least 3 times the following summer. The ministry will increase sampling and inspections at beaches that do not meet the A (excellent) or B (good) rating, and it will consult with the municipality to identify the source of contamination. These beaches will be sampled at least 5 times the following summer. New beaches will also be sampled at least 5 times when they first become part of the Environnement-Plage program.<sup>174</sup> A failing grade (D) means the beach will be temporarily closed until the samples show that the quality of the water is back to A,B, or C.<sup>175</sup> Many municipalities, such as Gatineau, carry out additional testing, often during alternating weeks, as part of the provincial Environnement-Plage program.<sup>176</sup>

Note that there are brackish waters in Québec. The St. Lawrence River, a grand river and estuary, empties into the Atlantic Ocean. Québec considers marine waters to have salinity equal to or greater than 10 parts per thousand. When water is of this salinity it is tested for *enterococci* rather than *E.coli*. This salinity level is found at the Saint Lawrence River at Jean-Port-Joli (MRC de l'Islet) and at Petite-Rivière-Saint-François (MRC de Charlevoix).<sup>177</sup>

### ***Parameters for monitoring recreational water quality***

#### **Indicator Bacteria**

Environnement-Plage uses a composite sampling technique to monitor beaches. This method entails collecting a large number of samples along a stretch of beach, then combining all the samples into a composite sample. The composite sample is then analyzed to provide an overview

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<sup>172</sup> Canada. Québec. *Loi sur la qualité de l'environnement*, c. ??, s. viii; Québec, "Fil D'information, Début du programme Environnement-Plage - Lanaudière," Portail Québec, <http://www.fil-information.gouv.qc.ca/Pages/Article.aspx?idArticle=2406231706> (accessed February 13, 2017).

<sup>173</sup> Canada. Québec, *Règlement sur la sécurité dans les bains publics*, B- 1.1, r.11; Québec, "Programme Environnement-Plage," Portail Québec, <http://www4.gouv.qc.ca/fr/Portail/citoyens/programme-service/Pages/Info.aspx?sqctype=sujet&sqcid=622> (February 2017).

<sup>174</sup> Québec, "Programme Environnement-Plage."

<sup>175</sup> Ibid.; Gille Delaunais, personal communication, email, 5 June 2017.

<sup>176</sup> Rachel Balderson, personal communication, email, August 29, 2016.

<sup>177</sup> Québec, "Communiqué de presse: Programme Environnement-Plage - Bilan régional, été 2016," MDDELCC, <http://www.mddelcc.gouv.qc.ca/infuseur/communique.asp?no=3581> (accessed October 19, 2016).

of the water quality at the stretch of beach where the samples were taken.

The length of the beach determines the number of samples to be taken and the number of composite samples that will be produced. A minimum of six samples is taken per beach. The analysis of the composite sample is used to determine whether a beach passes or fails water quality criteria. An arithmetic mean is used to calculate E.coli and *enterococci* counts (for example, the mean of 2 composite samples is the bacterial count).

In the event of an exceedance, resampling is to be carried out immediately, and the beach is closed until it passes water quality testing. If the beach fails a second test, the municipality shall, in accordance with Article 83 in the *Environmental Quality Act*, close the beach until the area has been remediated.<sup>178</sup>

Lorsque, après enquête, une piscine, une plage ou tout autre lieu de baignade est considéré une menace pour la santé, la municipalité doit en interdire l'accès jusqu'à ce que ces lieux aient été assainis.<sup>179</sup>

The public is notified by signs at the beach, notices on the ministry's website, or by phoning the regional environmental control call centre.<sup>180</sup>

The monitoring frequency for each beach is determined based on its rating. Ratings are assigned at the end of a season using an arithmetic mean of the swim season test results.

Rating	Quality	E. coli	Enterococci	Monitoring frequency /year
A	Excellent (Pass)	up to 20 / 100 mL	up to 5 / 100 mL	2 times
B	Good (Pass)	20-100 / 100 mL	6 – 20 / 100 mL	3 times
C	Fair (Pass)	100-200 / 100 mL	21-35 / 100 mL	5 times
D	Polluted (Fail)	≥201 / 100 mL	≥ 36/ 100 mL	5 times

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<sup>178</sup> Québec, *Vecteur La gestion des eaux de baignade : un monde de différences*, MDDELCC, Réseau Environnement.com, May 2010, 18-21, Accessed February 2017. <http://www.mddelcc.gouv.qc.ca/eau/recreative/VECTEUR-mai2010-DBrouillette.pdf>

<sup>179</sup> Canada. Québec. *Loi sur la qualité de l'environnement*, c. 49, d. viii, s.83.

<sup>180</sup> Québec, "Programme Environnement-Plage."

NEW BEACH				5 times
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### Cyanobacteria (fleurs d'eau d'algues bleu-vert et cyanotoxines)

Québec's protocol for cyanobacteria blue-green algae blooms is based on research by the Ministry of Sustainable Development, Environment, and Action Against Climate Change (Ministère du développement durable, de l'environnement et de la lutte contre les changements climatiques or MDDELCC) and the Ministry of Health and Social Services (Ministère de la Santé et des services sociaux or MSSS).<sup>181</sup>

Like most provinces, Québec follows the WHO's cyanobacteria criteria for recreational waters. A major difference is that the Institut National de Santé Publique du Québec (INSPQ) recommends that the WHO's low level of adverse health effects (20,000 cyanobacteria cells per mL), rather than at the levels that are considered moderate (100,000 cyanobacteria cells per mL), be followed.

MEEDLCC also considers a body of water impaired when cyanobacteria exceeds 20,000 cells per mL.

Le ministère de l'environnement (MDDELCC) considère qu'un milieu aquatique est affecté par une fleur d'eau de cyanobactéries lorsque leur abondance est d'au moins 20 000 cellules par millilitre.<sup>182</sup>

### MEEDLCC's Protocol for blue-green algae blooms:<sup>183</sup>

1. When a blue-green algae bloom is observed, the person or party who observed the bloom contacts the MDDELCC and makes a report. Individuals are invited to submit an online report to the MDDELCC. The bloom can also be reported to the local public health department.
2. After receiving a report, MDDELCC confirms the presence of blue-green algae. If field technicians suspect the presence of blue-green algae, a water sample is taken. If the

<sup>181</sup> Québec, "Algues bleu-vert," MSSS, <http://sante.gouv.qc.ca/conseils-et-prevention/algues-bleu-vert/> (accessed 23 January 2017); Québec, "Algues bleu-vert," MEEDLCC, <http://www.mddelcc.gouv.qc.ca/eau/flirivlac/algues.htm> (accessed 23 January 2017).

<sup>182</sup> Québec, "Cyanobactéries et cyanotoxines," Institute National de la Santé Publique, <https://www.inspq.qc.ca/eau-potable/cyanobacteries> (accessed February 13, 2017).

<sup>183</sup> Québec, "La gestion des épisodes de fleurs d'eau d'algues bleu-vert," MEEDLCC, <http://www.mddelcc.gouv.qc.ca/eau/algues-bv/outil-gestion/gestion-episodes.pdf> (accessed February 2017).

laboratory results of the test for cyanobacteria find there to be 20,000 cyanobacteria cells per mL or more, MDDELCC alerts the affected municipality that there is a bloom and informs them of test results. The person or party who originally observed the bloom is also notified.

3. When there is a confirmed blue-green algae bloom, MDDELCC follows general procedures for an affected water body. There are procedures for drinking water, recreational waters, and official public beaches. The department of public health can also take action if they are the first to be alerted by MDDELCC in case of risk to the health of the population.
4. In the case of a blue-green algae bloom at a public beach, the beach is either totally or partially closed, depending on the location of the bloom. All swimming, and contact with the affected area is prohibited. The public must be alerted to the potential dangers to their health, with signs or with other onsite barriers and information indicating what activities should be avoided until the bloom is no longer a threat. The regional tourist association or the municipality must also be notified of the bloom.

### **Cyanobacteria criteria prompting Québec to take action to protect public health<sup>184</sup>**

#### **Alert threshold for cyanobacteria:**

- **Low adverse health effects:** 20 000 cyanobacteria cells per mL
- **Moderate low adverse health effects:** 100,000 cyanobacteria cells / mL

#### **Alert threshold for cyanotoxins**

Québec's alert threshold for cyanotoxins were put in place to protect those most at risk of subchronic toxicity in the case of ingestion or contact with a cyanotoxin. Children are particularly vulnerable to cyanotoxins, because they spend more time in the water. Studies have shown that children ingest twice the amount of water as adults. Children also have a lower body weight.<sup>185</sup>

#### **Microcystin**

16µg/L

#### **Anatoxine -A**

40 µg/L

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<sup>184</sup> Québec, "Cyanobactéries et cyanotoxines."

<sup>185</sup> Ibid.



## Communication, beach postings, and advisories

The public is notified of water quality issues by signs at the beach. They can also access recreational water quality monitoring results for monitored beaches on the ministry's website. The website is updated daily at 11AM during monitoring season with any new water quality results. The public can also find out the water quality at monitored recreational water sites by phoning their regional the environmental control call centre.<sup>186</sup> In the case of cyanobacteria, the regional tourism association is also notified in order to spread information about the bloom.

## ***Recreational Water Quality Monitoring on-reserve in Québec***<sup>187</sup>

Health Canada's FNIHB is responsible for delivering environmental public health services to indigenous reserves in Québec (with the exception of communities under the Convention de la Baie-James et du Grand nord du Québec and transferred communities)

Seasonal monitoring of recreational Water is offered to communities. Each year a community action plan which could include a recreational water quality monitoring is developed with each First Nations Health Directions. EHOs from FNIHB's Environmental Public Health program support this initiative with equipment and provide training to community samplers.

In 2016, 40 swimming sites were sampled in 18 different communities. In the evaluation of the water-quality conditions, approximately 18-20 recreational water samples are taken. Samples are then sent to our accredited laboratory for analysis. Additional analyses are sometimes performed in certain indigenous communities by using their own on-reserve drinking water labs to test recreational water for indicator bacteria (E coli –Idexx Colilert Quantitray).

Interpretation of the results are done using recreational water quality guidelines which carry stricter criteria: the federal guidelines or provincial standards, models, or protocol. At the present time, the Québec provincial guidelines are used as reference to classify recreational waters.

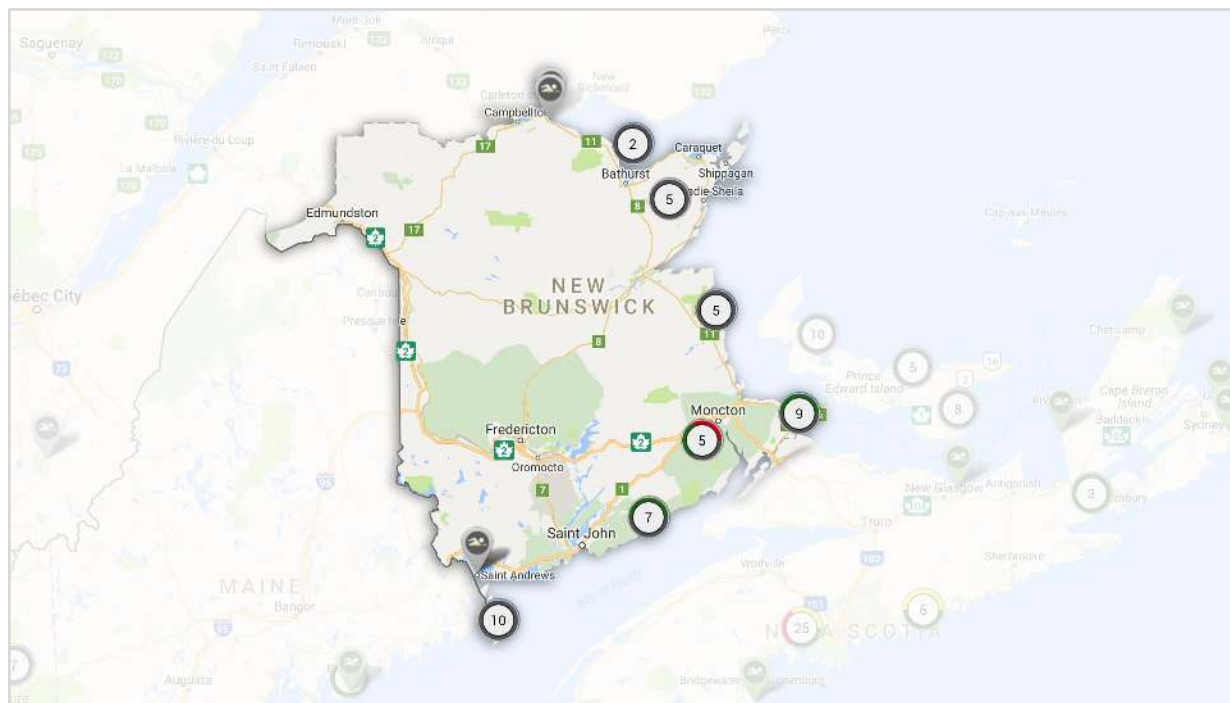
When any samples exceeds recreational water quality guidelines, the Community Health Director is alerted and public notice on-reserve follows. Communication of poor water quality can include a sign erected at the beach and radio notice.

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<sup>186</sup> Québec, "Programme Environnement-Plage."

<sup>187</sup> Oumar Ba, personal communication, 8 June 2017.

## New Brunswick



New Brunswick's Department of Tourism reports that there are approximately 60 official beaches for swimming and recreational water activities in the province. However, few of New Brunswick's beaches are monitored. New Brunswick had neither a standardized policy for recreational water quality monitoring at beaches and other untreated swim spots in the province<sup>188</sup> nor a set of recommendations for monitoring recreational water quality at fresh and marine water beaches.

Several municipalities have their own monitoring programs for local beaches. The City of Moncton monitors Centennial Park Beach during the swimming season. This is a man-made pool/beach with sand and its own water system that is not influenced by sewer or stormwater outfalls.<sup>189</sup> Another example of a municipal beach water testing program is that of the Town of Sackville, which monitors Silver Lake in Lillas Fawcett Park. The lake is tested weekly from June to September for *E. coli* and coliform. Results are posted at the lake.<sup>190</sup> In addition, a municipal beach called Aboiteau is monitored and may in future participate in the Blue Flag program, in which samples are collected

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<sup>188</sup> Diane. Fury, personal communication, phone, July 18, 2016.

<sup>189</sup> Heather Fraser, personal communication, phone, August 25-26, 2016.

<sup>190</sup> New Brunswick, "Town of Sackville," Tourism New Brunswick, <http://www.tourismnewbrunswick.ca/Products/L/Lillas-Fawcett-ParkandSilver-Lake.aspx> (accessed November 2016); Diane Fury, personal communication.

weekly during the beach season. The village of Cap Pelé monitors Aboiteau beach.

The provincial Department of Health originally carried out the very limited beach testing at other monitored beaches in the province. The department monitored Parlee Beach and Murray Beach, both provincial park beaches. The Department of Tourism took on the responsibility for New Brunswick's other beaches, developing a rating system for the beaches it monitors.

There are a number of limitations to the Department of Tourism's recreational water quality monitoring. The recreational water quality criteria, monitoring protocol, and the communication and advisory system are not clearly defined. The rating system for these beaches ranges from excellent, good, fair, and poor, to closed.<sup>191</sup> The ratings are based on *E. coli* and *enterococci* levels and rain events. However, this rating system is not a standard or policy, and information about the beach monitoring program is not public facing. The Department of Tourism at Parlee Beach only requires a beach to be closed to swimming in the case of an industrial or chemical spill or a widespread communicable disease outbreak.

There was significant media coverage in 2016 spotlighting this poorly defined beach water quality monitoring, which impacted public health at two of the provinces most popular beaches : Parlee and Murray. Poor public notice surrounding water quality problems at two of the province's most popular beaches are a long term problem. Protection of human health from contaminated recreational water was compromised by this system.

### ***Parameters for monitoring recreational water quality: Department of Tourism***

#### **Indicator Bacteria**

- **Excellent:** Water quality based on bacteriological counts is categorised the same as good. No limitations of activities.
- **Good:** No precipitation within the last 24 to 48 hours. Bacteriological data - between 0 & 99 *E. Coli*. / Faecal coliform or 0 to 14 *enterococci* within a 100 mL sample. Excellent weather conditions - absence of wind and waves. Light bather load. Clear water conditions.
- **Fair:** Low levels of precipitation in the last 24 to 48 hours: less than 10mm. Generally not less than 5mm in a 24-hour period. Bacteriological data - between 100 & 174 *E. Coli*. / Faecal coliform or 15 to 29 *enterococci* within a 100 mL sample. Absence of wind and waves. Moderate bather load. Absence of "undetermined matter" within the water. Absence of algae blooms. Moderately clear water conditions.
- **Poor:** Bacteriological data - between 175+ *E. Coli*. / Faecal coliform or 30 *enterococci* within a 100 mL sample. Windy/wavy conditions. Heavy bather load. Presence of

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<sup>191</sup> Gabrielle Fahmy, "Parlee Beach Water Quality Bacteria." *CBC*, August 29, 2016, accessed January 2017, <http://www.cbc.ca/news/canada/new-brunswick/parlee-beach-water-quality-bacteria-1.3740466>

"undetermined matter" in the water. Presence of algae blooms. Particularly cloudy/turbid water conditions. Factors to consider in the surrounding environment: Municipal storm and sewage / adjacent farms; Natural drainage/upsets/spills; Presence of large flocks of birds; Malfunction of nearby septic systems.

- **Closed:** Chemicals: industrial/spills. Widespread communicable disease outbreak.

## Cyanobacteria

In New Brunswick, the departments of Environment and Local Government (DELG) and Health (DH) work in partnership to respond to algal blooms.<sup>192</sup> The DELG responds to blooms and carries out sampling and analyses. Both the DELG and DH issue public health notices regarding cyanobacteria and toxic algae.

The *DH's Guidance for Public Advisories on Cyanobacterial Blooms in Recreational Water* recommends how advisories about algae blooms are communicated with the public.

## Communication, beach postings, and advisories

There is no provincial recommendation on how indicator bacteria exceedance and other recreational water quality information is to be communicated among monitoring bodies, stakeholders, and the public.

There are, however, clear guidelines on cyanobacteria advisories. When there is a blue-green algae bloom and/or toxic algae, the public is notified via the Government of New Brunswick's website, onsite signage, and in the media.<sup>193</sup>

## *Changes to New Brunswick recreational monitoring protocol: Spring 2017*

In April 2017, the province released a notice to the press that a new recreational water quality monitoring protocol is being developed in accordance with the *Canadian Guidelines for Recreational Water Quality*.<sup>194</sup> At the time of this report's publication, the updated protocol was specific to Parlee Beach. This new protocol is called the Parlee Beach Water Monitoring Protocol.

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<sup>192</sup> New Brunswick, *Algal Bloom Action Plan*, Department of Environment and Local Government, Water, 7 October 2016, Accessed December 9, 2016. <http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/Algae-Algues/AlgalBloomActionPlan.pdf>

<sup>193</sup> New Brunswick, "Public Health Advisories and Alerts," Office of Chief Medical Officer, [http://www2.gnb.ca/content/gnb/en/departments/ocmoh/health\\_advisories.html](http://www2.gnb.ca/content/gnb/en/departments/ocmoh/health_advisories.html) (accessed December 2016)

<sup>194</sup> New Brunswick, "New protocol for monitoring water quality at Parlee Beach," Department of Health, Department of Environment & Local Government, Department of Tourism, Heritage, & Culture, April 5, 2017, [http://www2.gnb.ca/content/gnb/en/news/news\\_release.2017.04.0435.html](http://www2.gnb.ca/content/gnb/en/news/news_release.2017.04.0435.html) (accessed April 2017).

The provincial government indicated that a province-wide update is forthcoming, and it will include increases to the number of monitored locations and monitoring of recreational water quality at these locations in accordance with the federal guidelines.<sup>195</sup>

A water quality monitoring protocol will be developed for Murray Beach and all other provincial parks based on the principles behind the protocol for Parlee Beach. The *Guidelines for Canadian Recreational Water Quality* require an assessment to be done for each provincial park in order to develop protocols for each of them. This assessment will be completed for all parks within the provincial park system before this summer.<sup>196</sup>

Due to the long term monitoring and reporting issues at Parlee beach we were not able to confirm the integrity of the new protocol and monitoring program in time for publication of the Canada Beach Report.

### ***Watershed Organizations in New Brunswick: Case Study***

Watershed organizations, such as the Petitcodiac Watershed Alliance (PWA) are funded through the Department of Environment and focus on monitoring the water quality of freshwater tributaries.<sup>197</sup>

The Petitcodiac Watershed Alliance operates primarily out of the Moncton area. When conducting water quality testing and monitoring, PWA is careful to avoid duplication of efforts with the City of Moncton, which also monitors a beach in the area. PWA uses the federal guidelines, tests for *E. coli* only, does not use a geometric mean, and collects one sample per beach on a monthly basis.

Other watershed organizations in New Brunswick include:

- Shediac Bay Watershed Alliance - provincial beaches
- Eastern Charlotte Waterways (southern New Brunswick) - marine waters

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<sup>195</sup> New Brunswick, Department of Health, *Parlee Beach Water Monitoring Protocol*, Spring 2017, accessed June 2017

<sup>196</sup> Ibid.

<sup>197</sup> Diane Fury, personal communication.

## Prince Edward Island



According to Tourism PEI, the island province has more than 800 kilometres of beaches and 90 official beaches. However, the province has neither instituted recreational water quality monitoring guidelines or standards, nor does it conduct monitoring of its marine or freshwater beaches.

The only recreational water quality monitoring on Prince Edward Island is conducted by Parks Canada. Parks Canada takes samples at four freshwater tributaries at three National Parks beaches: North Rustico, Stanhope, and Cavendish. The freshwater tributaries are sampled from the end of June to September on a weekly basis.

### ***Parameters for monitoring recreational water quality***

#### **Indicator bacteria**

Parks Canada samples for *E. coli*, and uses a single sample threshold of 200 *E. coli* / 100 mL for a single sample.<sup>198</sup>

Parks Canada posts an advisory at the outflow if the 30-day geometric mean at freshwater outflows rises above 200 *E. coli* / 100 mL of water. If a site exceeds recreational water quality criteria it is not resampled. There is no resampling in the instance of an exceedance as the samples

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<sup>198</sup> Arja Page, personal communication, Phone interview, September 29, 2016.

take between 3 and 5 days to process.

### **Parks Canada threshold**

200 *E. coli* / 100 mL of water - 30-day geometric mean

### **Cyanobacteria**

Blue-green algae and toxic blooms are uncommon in PEI. There is no monitoring program in place for cyanobacteria. Rather, blooms are monitored and advisories are issued on a case-by-case basis. The Department of Communities, Land, and Environment, in coordination with Public Health, handle reports of blooms. PEI's chief medical officer issues a public advisory when a water body is affected with a "heavy growth" of blue-green algae.<sup>199</sup>

### **Communication, beach postings, and advisories**

In the case of a water quality issue at a recreational site, onsite public notices are put up. Parks Canada also shares the information with stakeholders. In the case of blue-green algae, additional measures are taken to communicate the health risks with the public. Onsite signage is put up to inform recreational water users of the associated health risks. The government of PEI also has a website where cyanobacteria alerts are posted.<sup>200</sup>

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<sup>199</sup> Prince Edward Island, "Blue-Green Algae (Cyanobacteria)," Communities, Land, and Environment, <https://www.princeedwardisland.ca/en/information/communities-land-and-environment/blue-green-algae-cyanobacteria> (accessed October 2016).

<sup>200</sup> Ibid.

## Nova Scotia



Nova Scotia does not have a provincial protocol or set of guidelines for monitoring recreational water in the province.

The Nova Scotia Lifeguard Society (NSLS) and the Halifax Regional Municipality (HRM) conduct regular monitoring of recreational waters. In addition to supervising beaches, the Department of Health and Wellness contracts the NSLS to conduct weekly testing of the water at all supervised beaches to ensure the water meets the criteria recommended in *Guidelines for Canadian Recreational Water Quality*. The province recommends the *Guidelines for Canadian Recreational Water Quality* to the authorities managing and monitoring beaches.

The Environmental Health Division assists with the interpretation of sample results and takes action with the Regional Medical Officer of Health to ensure swimmers are protected from water that has bacteria levels higher than those indicated in the Canadian Guidelines for Recreational Water Quality.<sup>201</sup>

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<sup>201</sup> Nova Scotia, "Nova Scotia Beaches," Environmental Health, Recreational Water <http://novascotia.ca/dhw/environmental/beaches.asp> (accessed December 11, 2016).



On 1 July 2016 Nova Scotia Environment was formed, consolidating several departments: the Department of Natural Resources, the Department of Health and Wellness, the Department of Agriculture, Nova Scotia Environment, and the Department of Fisheries and Aquaculture. The Environmental Health and Food Safety Division of Nova Scotia Environment now coordinates the assessment of and response to reported or suspected health hazards at beaches in Nova Scotia.<sup>202</sup>

### ***Halifax Regional Municipality***

The Halifax Regional Municipality (HRM) monitors water quality at 23 supervised beaches in the Halifax region on a minimum weekly basis in July and August. While there are no official provincial standards in place for beach management, the municipality's beach monitoring program is based on the *Guidelines for Canadian Recreational Water Quality*.<sup>203</sup>

Beaches are managed (i.e., closure and re-opening of beaches) cooperatively between the HRM, Halifax Water, Nova Scotia Environment, and the local Medical Officer of Health through the Nova Scotia Department of Health and Wellness.<sup>204</sup>

Generally, water at inland beaches is tested for *E. coli*, and marine or estuarine beaches are tested for *Enterococci*. Currently, two samples are collected at each beach; openings and closures are determined based on the framework for single samples, which correspond to the federal recreational water quality maximum values for a single sample.<sup>205</sup>

### ***Parameters for monitoring recreational water quality***

#### Indicator bacteria

#### ***E. coli***

- 400 *E. coli* / 100 mL – single sample maximum

*E. coli* is the indicator bacteria for water quality. In the event of a single sample exceedance of the maximum guideline value of 400 *E. coli* / 100 mL for a single sample, the beach will be posted and

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<sup>202</sup> Nova Scotia, “ Highlights,” <http://novascotia.ca/nse/environmental-health/> (accessed December 2016).

<sup>203</sup> Cameron Deacoff, personal communication, email, August 30, 2016.

<sup>204</sup> Ibid.

<sup>205</sup> Ibid.

closed for swimming and re-sampling will take place.<sup>206</sup>

In addition, the HRM also re-samples if a single sample exceeds the federally-prescribed geometric mean guideline of 200 *E. coli* / 100 mL of water. In these circumstances the beach would not be closed unless the single sample maximum value is also exceeded.<sup>207</sup>

### ***Enterococci***

- 70 *Enterococci* / 100 mL – single sample maximum

*Enterococci* is the indicator bacteria for marine or estuarine (brackish water) beaches. In the event of a single sample exceedance of the maximum guideline value of 70 *enterococci* / 100 mL for a single sample, the beach is posted and closed for swimming and re-sampling takes place.<sup>208</sup>

In addition, the HRM also re-samples if a single sample exceeds the federally-prescribed geometric mean guideline of 35 *enterococci* / 100 mL of water. In these circumstances the beach would not be closed unless the single sample maximum value is also exceeded.<sup>209</sup>

### **Cyanobacteria**

During the (rare) suspected presence of blue-green algae, samples will be collected to confirm that cyanobacteria is present. In such an event, the HRM follows the federal guidelines in posting or closing the beach.<sup>210</sup>

### **Communication, beach postings, and advisories**

Beaches are physically posted when sample result values exceed the single sample maximum guidelines (mentioned above) for either *E. coli* or *enterococci*. Lifeguards on duty at these supervised beaches will also advise beachgoers to avoid swimming or contact with water.<sup>211</sup>

In addition, beach status is posted on the municipality's website at <http://www.halifax.ca/rec/aquatics/beaches.php>; on Twitter alerts (@HfxGov); via the media room at <https://apps.halifax.ca/>

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<sup>206</sup> Ibid.

<sup>207</sup> Ibid.

<sup>208</sup> Ibid.

<sup>209</sup> Ibid.

<sup>210</sup> Ibid.

<sup>211</sup> Ibid.

hfxnews; and on the municipality's Beach Hotline, 902.490.5458.<sup>212</sup>

### ***Nova Scotia Lifeguard Service***

The NSLS monitors water quality at 23 supervised beaches across Nova Scotia. The beach monitoring program is based on the *Guidelines for Canadian Recreational Water Quality*.<sup>213</sup>

### ***Parameters for monitoring recreational water quality***

#### **Indicator Bacteria**

The majority of the beaches are marine. Water is tested weekly with 5 samples collected from each beach.<sup>214</sup> *Enterococci* is the indicator bacteria for marine waters, while *E. coli* is used for freshwater.<sup>215</sup> Five samples are collected at each beach, and openings and closures are determined according to the federal recreational water quality maximum values for both single sample maximum and geometric mean:

#### ***E. coli***

- 400 *E. coli* / 100 mL - single sample maximum
- 200 *E. coli* / 100 mL - geometric mean of 5 samples

#### ***Enterococci***

- 70 *Enterococci* / 100 mL - single sample maximum
- 35 *Enterococci* / 100 mL - geometric mean of 5 samples

#### **Cyanobacteria**

During the (rare) suspected presence of blue-green algae, samples will be collected to confirm that cyanobacteria is present. In such an event, the NSLS follows the federal guidelines for posting or closing the beach.<sup>216</sup>

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<sup>212</sup> Ibid.

<sup>213</sup> Nova Scotia Lifeguard Services, "Supervised Beaches," <http://www.nsls.ns.ca/supervised-beaches> (accessed August 2016).

<sup>214</sup> Sara Jennex, personal communication, location, August 31, 2016.

<sup>215</sup> Ibid.

<sup>216</sup> Ibid.

### Communication, beach postings, and advisories

The Department of the Environment sends sample results to the province's Medical Officer of Health, who has the authority to close a beach. Officials will close a beach if the *Enterococci* level reaches 70 counts per 100 mL of water. Beaches may be retested when counts exceed 200 *E. coli* per 100 mL of water. When counts exceed 35 *Enterococci* per 100 mL, beaches are retested every 24 to 48 hours until levels drop below the accepted levels and closure is considered.

Lifeguards on duty at supervised beaches will advise beachgoers to avoid swimming or contact with water. The Department of Health and Wellness will issue public notices once a beach is reopened. Beach status is displayed on the NSLS website at <http://www.nsls.ns.ca/?q=supervised-beaches>.<sup>217</sup>

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<sup>217</sup> Sueann Musick, "Lifeguard service: Beach closures are not common." New Glasgow News, August 14, 2015, accessed August 2016, <http://www.ngnews.ca/News/Local/2015-08-14/article-4246618/Lifeguard-service-beach-closures-are-not-common/1>

## Newfoundland and Labrador



The public, recreational beaches/natural swimming areas of Newfoundland and Labrador are not routinely monitored, tested, or sampled for recreational water quality and exceedance. This includes both marine and freshwater swimming sites. However, indicator bacteriological monitoring and cyanobacteria monitoring are conducted on an as-needed basis.

Under the 1986 Canada-Newfoundland and Labrador Water Quality Monitoring Agreement (WQMA), Environment and Climate Change Canada and the provincial Department of Environment and Climate Change Conservation monitor ambient surface water quality at about 120 sampling locations and water bodies. The main management goal of this federal-provincial agreement is to

“ensure water quality is suitable for different beneficial water uses.”<sup>218</sup> Chemical and physical parameters are collected under this monitoring program. Bacteriological monitoring is sometimes included in ambient surface water quality monitoring. However, bacteriological monitoring is not undertaken to provide information regarding suitability for swimming and other recreational water activities.

### ***Parameters for monitoring recreational water quality***

#### **Indicator bacteria**

Service Newfoundland and Labrador conducts bacteriological monitoring of natural swimming areas in the province on an as-needed basis.<sup>219</sup>

#### **Cyanobacteria**

The Department of Environment and Climate Change monitors blue-green algae. This fairly new initiative commenced in 2007. Prior to August 2007, blue-green algae were not prevalent in Newfoundland and Labrador.<sup>220</sup>

The Department of Environment and Climate Change monitors cyanobacteria on a case-by-case basis. The Department investigates blooms as reports of their presence are received.

The Department follows Health Canada's *Guidelines for Canadian Drinking Water Quality* for microcystin-LR when a drinking water supply is at risk. However, to date no drinking water has been affected with toxic algae in Newfoundland and Labrador.<sup>221</sup> All other water bodies are monitored according to the *Guidelines for Canadian Recreational Water Quality*.<sup>222</sup>

- Microcystin-LR not exceeding 1.5 ug/L (drinking water)
- Total cyanobacteria not exceeding 100,000 cells/mL and total microcystins not exceeding 20 ug/L (expressed as microcystin-LR). (recreational water)

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<sup>218</sup> Newfoundland Labrador, “Water Quality Monitoring Agreement,” Department of Environment and Conservation, <http://www.env.gov.nl.ca/env/waterres/quality/background/agreement.html> (accessed November 1, 2016).

<sup>219</sup> Renee Paterson, personal communication, location, December 5, 2016.

<sup>220</sup> Newfoundland Labrador, “Blue-Green Algae Cyanobacteria,” Department of Environment and Conservation, <http://www.env.gov.nl.ca/env/waterres/quality/background/bgalgae.html> (accessed November 18, 2016).

<sup>221</sup> Newfoundland Labrador, *Blue-Green Algae Monitoring Summary Report 2007-2015*, Department of Environment and Conservation, March 2016, Accessed November 18, 2016. [http://www.env.gov.nl.ca/env/waterres/quality/background/bga\\_reports/bga\\_rpt2016.pdf](http://www.env.gov.nl.ca/env/waterres/quality/background/bga_reports/bga_rpt2016.pdf)

<sup>222</sup> Ibid.

### Communication, beach postings, and advisories

The following channels of communication are used to alert the public about a recreational water quality issue: onsite signage, website, media outlets like TV and radio, and social media. The channels used depend on the area that is affected by a recreational water quality issue.<sup>223</sup>

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<sup>223</sup> Renee Paterson, personal communication.

## Nunavut, Northwest Territories, and Yukon



The territories of Nunavut, Northwest Territories, and Yukon do not routinely monitor beaches.

### ***Yukon***

The Yukon government does not implement routine testing or monitoring at any of the beaches in



the territory.<sup>224</sup> Yukon beaches are not staffed by lifeguards. In the case of problems (e.g., algae blooms, which do not frequently occur) the Yukon government has a regulation it can follow; however, this situation is atypical.<sup>225</sup> In June and July, the lakes tend to be less suitable for swimming as they become even colder due to glacial melt. To avoid the physical risks of river swimming, families and children are encouraged to make use of community pools for swimming and recreation.<sup>226</sup>

### ***Northwest Territories***

The government of the Northwest Territories does not monitor beach or recreational water quality.<sup>227</sup>

### ***Nunavut***

Nunavut does not have a regular beach sample or monitoring program. Most recreational water activities in the territory involve boating, often for purposes of hunting.<sup>228</sup> While some testing is conducted in relation to pollution or contamination at beaches, this work is neither territory wide, nor carried out at regular intervals.<sup>229</sup> The Department of Health monitors recreational water on a complaints-based basis.

In the case of a report of contamination of a fresh or marine water site, the Department of Health may work with the Department of Environment or Indigenous and Northern Affairs Canada (INAC). Public health issues related to water are communicated to affected communities via the Chief Medical Officer of Health. This is done in accordance with the standards mandate and responsibility under the Public Health Act.<sup>230</sup>

The presence of blue-green algae is not monitored in Nunavut.

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<sup>224</sup> Environment Yukon, personal communication, phone, August 22, 2016.

<sup>225</sup> Ibid.

<sup>226</sup> Ibid.

<sup>227</sup> Peter Workman, personal communication, phone, August 24, 2016.

<sup>228</sup> Michele Leblanc-Havard, personal communication, email, 9 January 2017.

<sup>229</sup> David Oberg, personal communication, email, 14 December 2016

<sup>230</sup> Michele Leblanc-Havard, personal communication.

## National Highlights

### *Recreational water quality monitoring leaders*

Alberta and Manitoba are leaders in blue-green algae monitoring. Alberta monitors cyanobacteria and cyanotoxins proactively.

Québec follows the strictest guidelines in Canada for monitoring cyanobacteria. The Institut National de Santé Publique du Québec (INSPQ) recommends that the WHO's low level of adverse health effects (20,000 cyanobacteria cells per mL), be followed.

Ontario stands out as a leader in recreational water quality monitoring and information reporting. In general, Ontario's municipal governments do a better job testing waters and sharing information than other provinces. Ontario applies one of the best recreational water quality guidelines for protecting public health and the environment. Kingston, Ontario also has the only real-time combined sewer overflow and sewage bypass alert system in the country.

Despite the province's short summer, cold water temperatures, and lack of sandy beaches Newfoundland and Labrador monitor recreational water quality on a case by case basis, following the federal guidelines.

New Brunswickers brought attention to the poor recreational water quality monitoring and public notice practices at Parlee and Murray Beach in 2016. As a result of public and media pressure, New Brunswick made significant improvements to recreational water quality monitoring and public notice practices at these beaches in 2017.

Recreational water quality monitoring programs on Indigenous reserves seem to have more community involvement when it comes to determining whether a water body should be monitored for recreational water quality.

## Recommendations

In order to protect public health and inspire people to restore and protect Canada's water bodies, recreational water quality monitoring in Canada needs to improve at the provincial and municipal level.

Most Canadians continue to swim and recreate in unmonitored and under-monitored waters. Canadians are not alerted to events that could contaminate their waters and impact their health.

Swim Guide offers the following ten recommendations to provinces and municipal monitoring authorities:

1. Provinces without standardized recreational water quality monitoring should develop and implement a recreational water quality monitoring model or protocol for their municipalities, EHOs, and beach operators, based on the federal guidelines for recreational water quality monitoring.
2. More water bodies and recreational water sites need to be monitored in all provinces, to better reflect the growing popularity of outdoor recreation activities.
3. Beaches should be tested more frequently in all provinces, to improve the accuracy of water quality information being communicated to the public.
4. Recreational water quality information should be released to the public faster and through more channels (e.g., social media, press releases). In addition to physical signs at beaches and swim spots, the public should be able to access results online, and through other media.
5. Current recreational water quality data from monitoring program, including information such as date of sample and bacteria counts, should be open and accessible to the public.
6. The public should be notified when wet weather events could impact the quality of their recreational waters and put their health at risk.
7. The public should be notified of combined sewer overflows that impact the quality of their waters with untreated sewage. Kingston's new real-time warning system is recommended as the gold standards for CSO notification.
8. The public should be notified when there are bypasses at sewage treatment plants.
9. Municipalities with old wastewater infrastructure, including combined sewers, should have a plan in place to separate their sewage from their stormwater.
10. Water literacy campaigns should be launched to help the public better understands the impact poor water quality may have on their health and waterways, the sources of pollution at their favourite beaches and swim spots, and actions they can take to protect their health and the health of the environment.

## Appendix A

[illegible]

To download a copy of the Canada Beach Report graphic, visit [www.theswimguide.org](http://www.theswimguide.org)

## Appendix B

### Summary of number of monitored beaches per province/territory

Province/Territory	Public Beaches *	Monitored Public Beaches
British Columbia	450	280
Alberta	250	46**
Saskatchewan	70	0
Manitoba	60	60
Ontario	850	850
Quebec	400	350
New Brunswick	60	2
Nova Scotia	100	46
Prince Edward Island	>90	4
Newfoundland and Labrador	N/A	0
Nunavut	N/A	0
Northwest Territories	N/A	0
Yukon	N/A	0

\*Public beaches are those recognized by local governments as official natural bathing locations. Beaches on Indigenous reservations are not included.

\*\*This number reflect beaches monitored by AHS. Approximately 200 beaches had varying levels of sampling for faecal coliforms completed by their own operators.

## Appendix C

### Summary of Public Reporting Practices

Province/ Territory	Routine Reporting	Media Advisories	Phone Hotline	Website	Social Media Reporting	Mobile App	In Swim Guide
British Columbia	✓	✓*	✓*	✓*	✓*	X	✓
Alberta	✓	✓	X	✓	X	X	✓
Saskatchewan	X	N/A	N/A	N/A	N/A	N/A	N/A
Manitoba	✓	✓	✓	✓	✓	X	✓
Ontario	✓	✓*	✓*	✓*	✓*	✓*	✓
Québec	✓	✓	X	✓	X	X	✓
New Brunswick	X	X	X	✓ (BGA)	X	X	✓
Nova Scotia	✓	✓	X	✓	X	X	✓
PEI	✓	✓ (BGA)	X	✓ (BGA)	X	X	✓
Newfoundland and Labrador	X	✓	X	✓ (BGA)	✓	X	X
Nunavut	X	N/A	N/A	N/A	N/A	N/A	N/A

Northwest Territories	X	N/A	N/A	N/A	N/A	N/A	N/A
Yukon	X	N/A	N/A	N/A	N/A	N/A	N/A

✓="Yes"    ✓\*="Varies by health unit"    ✓(BGA)="Yes, Blue Green Algae"    X="No"    N/A ="Not Applicable"

## Appendix D

### Other Automated or Routine Alerts for Recreational Water Users

Province/ Territory	Wet weather alerts	Sewage bypass	Combined Sewer Overflow (CSO)
British Columbia	X	X	X
Alberta	X	X	X
Saskatchewan	X	X	X
Manitoba	✓*	X	✓
Ontario	✓*	✓* (Sudbury, Kingston, Ottawa)	✓ (Kingston only)
Québec	X	X	X
New Brunswick	X	X	X
Nova Scotia	X	X	✓*
PEI	X	X	X
Newfoundland and Labrador	X	X	X
Nunavut	X	X	X
Northwest Territories	X	X	X
Yukon	X	X	X

✓="Yes"    ✓\*="Varies by region"    X="No"



## Links and Resources

### British Columbia Links and Resources

Fraser Health: [http://www.fraserhealth.ca/your\\_environment/recreational\\_water/beach\\_conditions/beach-condition-reports](http://www.fraserhealth.ca/your_environment/recreational_water/beach_conditions/beach-condition-reports)

Interior Health: <http://www.interiorhealth.ca/YourEnvironment/RecreationalWater/Documents/Beach-sample-results.pdf> and <https://www.interiorhealth.ca/YourEnvironment/RecreationalWater/Pages/default.aspx>

Island Health: [http://www.viha.ca/mho/recreation/beach\\_reports.htm](http://www.viha.ca/mho/recreation/beach_reports.htm)

Northern Health: [http://www.healthspace.ca/Clients/NHA/NHA\\_Website.nsf](http://www.healthspace.ca/Clients/NHA/NHA_Website.nsf)

Vancouver Coastal Health: Metro Vancouver: <http://www.vch.ca/public-health/environmental-health-inspections/pools-beaches/beach-water-quality-reports>

Vancouver Coastal Health: Coast Garibaldi: <http://healthspace.ca/vch>

First Nations Health Authority: <http://www.fnha.ca/>

British Columbia Ministry of Environment Recreational water quality guidelines: <http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines/approved-water-quality-guidelines>

### Alberta

Alberta Health Services: <https://myhealth.alberta.ca/alerts/Pages/Alberta-Health-Advisories.aspx>

### Saskatchewan

Environmental Health, Swimming Pools and Recreational Water: <https://www.saskatchewan.ca/residents/environment-public-health-and-safety/environmental-health/swimming-pools-and-recreational-water>

## Manitoba

Manitoba Sustainable Development, Manitoba Beaches: <http://www.manitoba.ca/beaches>

## Ontario

Recreational Water Protocol, 2016: [http://www.health.gov.on.ca/en/pro/programs/publichealth/oph\\_standards/docs/recreational\\_water.pdf](http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/recreational_water.pdf)

Kingston Utilities “Know Before You Go” Wastewater notification system: <https://utilitieskingston.com/Wastewater/SewerOverflow/Map>

## Québec

Environnement-Plage home: <http://www.mddelcc.gouv.qc.ca/programmes/env-plage/index.htm>

Adresses du Ministère en région: [http://www.mddelcc.gouv.qc.ca/ministere/rejoindr/adr\\_reg.htm](http://www.mddelcc.gouv.qc.ca/ministere/rejoindr/adr_reg.htm)

Cyanobacteria: <https://www.inspq.qc.ca/eau-potable/cyanobacteries>

## New Brunswick

Public Health Advisories and Alerts: [http://www2.gnb.ca/content/gnb/en/departments/ocmoh/health\\_advisories.html](http://www2.gnb.ca/content/gnb/en/departments/ocmoh/health_advisories.html)

Parlee Beach Water Monitoring Protocol (2017):  
[http://www2.gnb.ca/content/dam/gnb/Departments/eco-bce/Promo/Parlee\\_Beach/parlee\\_beach\\_water\\_monitoring\\_protocol\\_document.pdf](http://www2.gnb.ca/content/dam/gnb/Departments/eco-bce/Promo/Parlee_Beach/parlee_beach_water_monitoring_protocol_document.pdf)

## Nova Scotia

Environmental Health, Recreational Water - Nova Scotia Beaches: <http://novascotia.ca/dhw/>

<environmental/beaches.asp>

Nova Scotia Lifeguard Services, Supervised Beaches: <http://www.nsls.ns.ca/supervised-beaches>

## Prince Edward Island

Prince Edward Island, Communities, Land, and Environment, Blue-Green Algae (Cyanobacteria): <https://www.princeedwardisland.ca/en/information/communities-land-and-environment/blue-green-algae-cyanobacteria>

## Newfoundland and Labrador

Newfoundland Labrador, Department of Environment and Conservation, Water Quality Monitoring Agreement: <http://www.env.gov.nl.ca/env/waterres/quality/background/agreement.html>

Newfoundland Labrador, Department of Environment and Conservation, Blue-Green Algae Monitoring Summary Report 2007-2015, March 2016: [http://www.env.gov.nl.ca/env/waterres/quality/background/bga\\_reports/bga\\_rpt2016.pdf](http://www.env.gov.nl.ca/env/waterres/quality/background/bga_reports/bga_rpt2016.pdf)