

Hamilton Public Health Services 2022 Beach Monitoring Report

Background

This is an annual update regarding Hamilton Public Health Services' (PHS) recreational water quality monitoring at Hamilton's public beaches. The Ontario Public Health Standards (OPHS) specify the public health programs and services Boards of Health must deliver. Program and topic-specific protocols under the OPHS further define the minimum responsibilities every Board of Health in Ontario is accountable to provide. To assist in the prevention and reduction of water-borne illness and injury related to recreational water use at a public beach, Boards of Health are directed by the Recreational Water Protocol (2019) and the Operational Approaches for Recreational Water Guideline (2018). Both documents guide the delivery of the local Beach Water Quality Monitoring Program in Hamilton.

In 2022 Hamilton PHS conducted routine beach surveillance at seven public beaches in Hamilton. A public beach is "any public bathing area owned and operated by a municipality where the public has access and there is reason to believe that there is recreational use of the water" (MOHLTC, 2019). The seven monitored beaches in Hamilton were Beach Boulevard, Van Wagner's and Confederation Park Beaches along Lake Ontario; Binbrook, Christie and Valens Conservation Area beaches, and Pier 4 Park Beach in Hamilton Harbour. Bayfront Park Beach remained closed to users due to a history of poor water quality. Routine beach inspections are conducted before the swimming season begins and throughout the summer, to monitor the safety of the public swimming areas and to establish strategies for the management of health hazards.

Beach Water Quality Monitoring

Hamilton PHS monitors the safety of public beaches by collecting and testing the beach water for *E. coli* bacteria during the swimming season, typically between the Victoria Day long weekend in May and the Labour Day long weekend in September. Beach water quality is monitored for both *E. coli* bacteria and blue-green algae (BGA) blooms.

E. coli

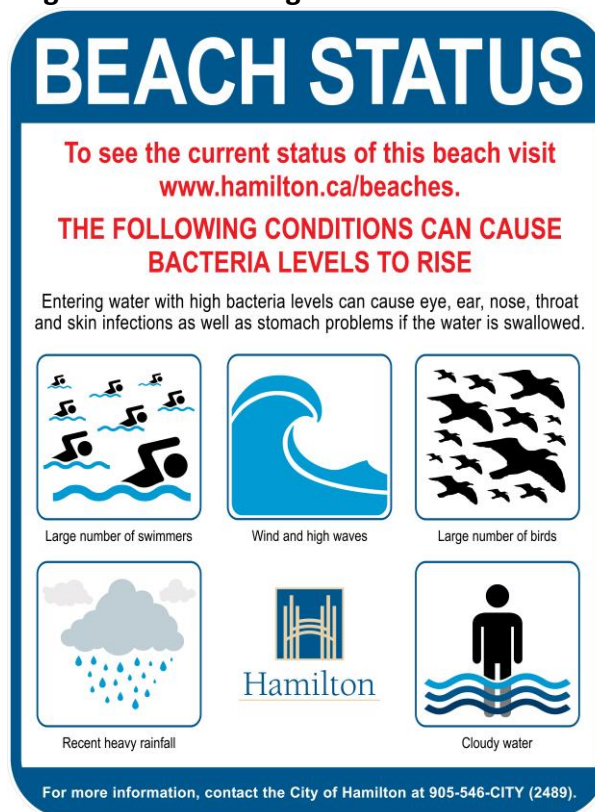
E. coli are naturally found in the intestines of humans and warm-blooded animals. High numbers of *E. coli* in the water indicates the presence of faecal contamination and the potential presence of other harmful microorganisms such as *Cryptosporidium*, *Giardia*, *Shigella*, norovirus and *E. coli* 0157:H7 (CDC, 2017). These organisms have the potential to cause a variety of infections including gastrointestinal, skin, ear, respiratory, eye, neurologic and wound infections (CDC, 2017). The maximum acceptable concentration of *E. coli* at a beach is 200 *E. coli* colony-forming units (CFUs) per 100 ml of water (MOHLTC, 2018). *E. coli* concentrations above this level could represent an increased risk of infection to swimmers.

The Operational Approaches for Recreational Water Guideline (2018) states that a minimum of five samples must be collected at each beach and the geometric mean of *E. coli* concentrations must be used to assess recreational water quality and guide public health action. Samples are collected by HPS staff and analysed at the Public Health Ontario regional laboratory in Hamilton.

When the geometric mean (GM) of *E. coli* concentrations is above 200 CFUs per 100 ml of water, warning signs are posted at the affected beach to advise potential users that the water may pose a health risk and the beach is deemed as unsafe for swimming. The beach will also be posted as unsafe for swimming if any single point sample taken has a test result above 400 CFUs per 100 ml of water (MOHLTC, 2018).

In addition to posting warning signs at the affected beaches, PHS updates the City of Hamilton's Beach Water Quality Website (www.hamilton.ca/beaches) and the Safe Water Information Line outgoing phone message (905-546-2189) to reflect the current beach water quality status. As sampling frequency is conducted on a weekly basis at a minimum, conditions such as wave and wind activity, number of birds, recent heavy rainfall and cloudy can influence beach water quality on a day-to-day basis. In an effort to help further inform the public and guide their decision on beach water quality, new signs (Fig. 1) were developed in 2022 and posted permanently at all public beaches.

Fig. 1: New Beach Signs



Cyanobacteria (Blue-Green Algae)

Cyanobacteria or blue-green algae (BGA) are microorganisms which occur naturally in aquatic environments and flourish in warmer, slow-moving or still waters with high nutrient levels and sufficient levels of sunlight (Miller and Russell, 2017). Some cyanobacteria produce microcystin toxins which are the most commonly produced toxin of the cyanobacterial toxins. Microcystin toxins are tasteless, colourless and odourless, and are toxic to both humans and animals. Typical exposure routes are through skin contact or through ingestion and/or inhalation while swimming. Short-term exposure can cause skin irritation, rash, vomiting and fever while long-term exposure (mostly through drinking contaminated water) can lead to tumour formation with microcystin-LR being a possible human carcinogen (Miller and Russell, 2017).

Hamilton PHS monitors public beaches for the presence of microcystin toxins throughout the swimming season. The Health Canada Guidelines for Canadian Recreational Water Quality Cyanobacteria and their Toxins (2020) proposes the guideline value for total microcystins in recreational water be a maximum concentration of 10 µg/L. When potential toxin-producing cyanobacterial blooms are observed at a public beach, Hamilton PHS uses Abraxis™ test strips to measure the concentration of microcystin toxins in the water. When the concentration of microcystins is detected above 10 µg/L, the beach is closed, and a swimming advisory is issued. Hamilton PHS issues a media release and posts closure signs at the affected beach. The City of Hamilton's Beach Water Quality website and the Safe Water Information Line's outgoing phone message are also updated. PHS does not routinely monitor for *E. coli* bacteria when a beach has been closed due to microcystin toxins.

Hamilton PHS issues a media release and posts closure signs at the affected beach. The City of Hamilton's Beach Water Quality website and the Safe Water Information Line's outgoing phone message are also updated. PHS does not routinely monitor for *E. coli* bacteria when a beach has been closed due to microcystin toxins.

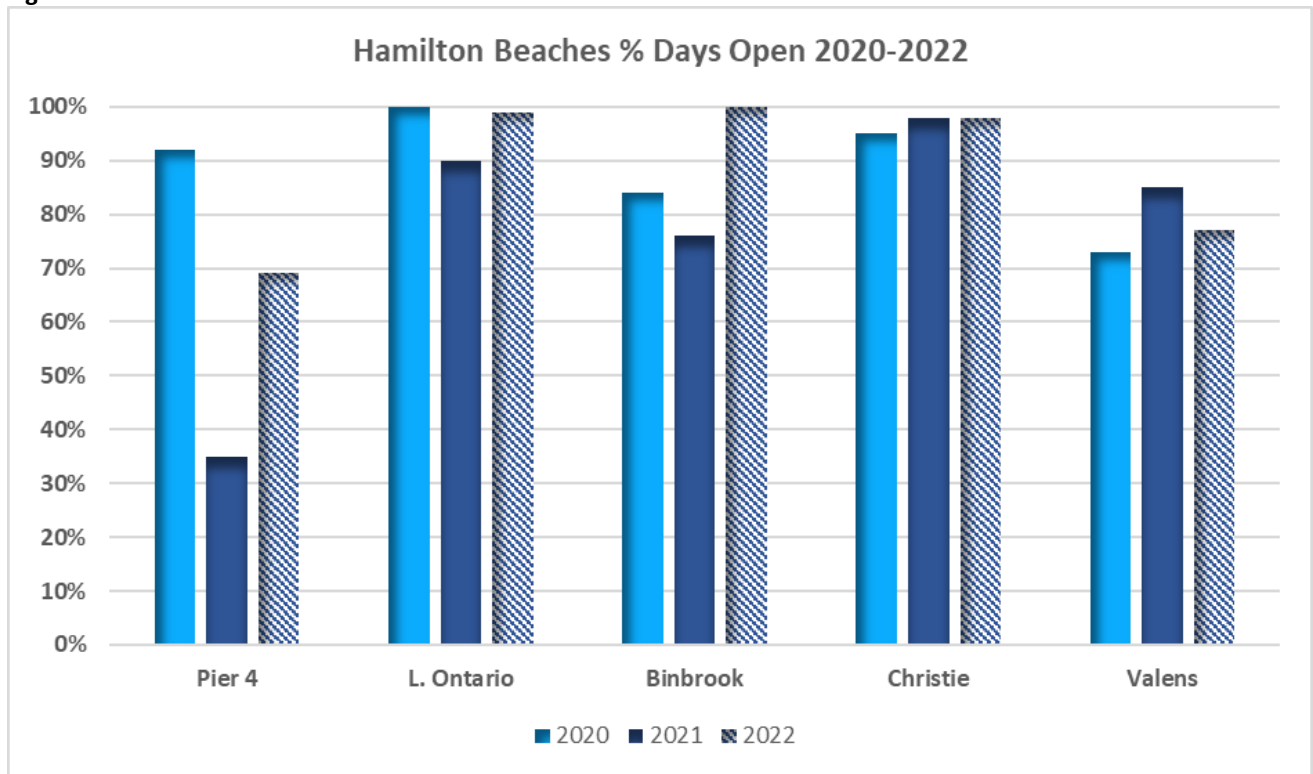
2022 Beach Water Quality Monitoring Results

The 2022 beach monitoring program took place over an approximate 14-week period beginning immediately following the Victoria Day weekend in May until the end of August. Table 1 on the following page summarizes the data for the 2022 swimming season at each public beach. The far-right column indicates the total percentage of days the beach was open for swimming. In Hamilton Harbour, Pier 4 Beach's water quality was acceptable for swimming 69% of the time. Lake Ontario beaches were open between 98 and 100% of the season in 2022, while Binbrook, Christie and Valens Conservation Area Beaches were open 100%, 98% and 77% respectively.

Table 1: Beach Water Quality Summary

Name of Beach	Total # of Days in Bathing Season	# of Days Beach Posted due to <i>E. coli</i>	# of Days Beach Closed due to BGA	Total # of Days Beach Closed	Total # of Days Beach Open	% of Days Beach Open
Hamilton Harbour						
Pier 4 Beach	98	11	19	30	68	69%
Lake Ontario Beaches						
Beach Boulevard	98	2	0	2	96	98%
Van Wagner's	98	0	0	0	98	100%
Confederation Park	98	0	0	0	98	100%
Conservation Area Beaches						
Binbrook Conservation	98	0	0	0	98	100%
Christie Conservation	98	2	0	2	96	98%
Valens Conservation	98	23	0	23	75	77%

Fig. 2

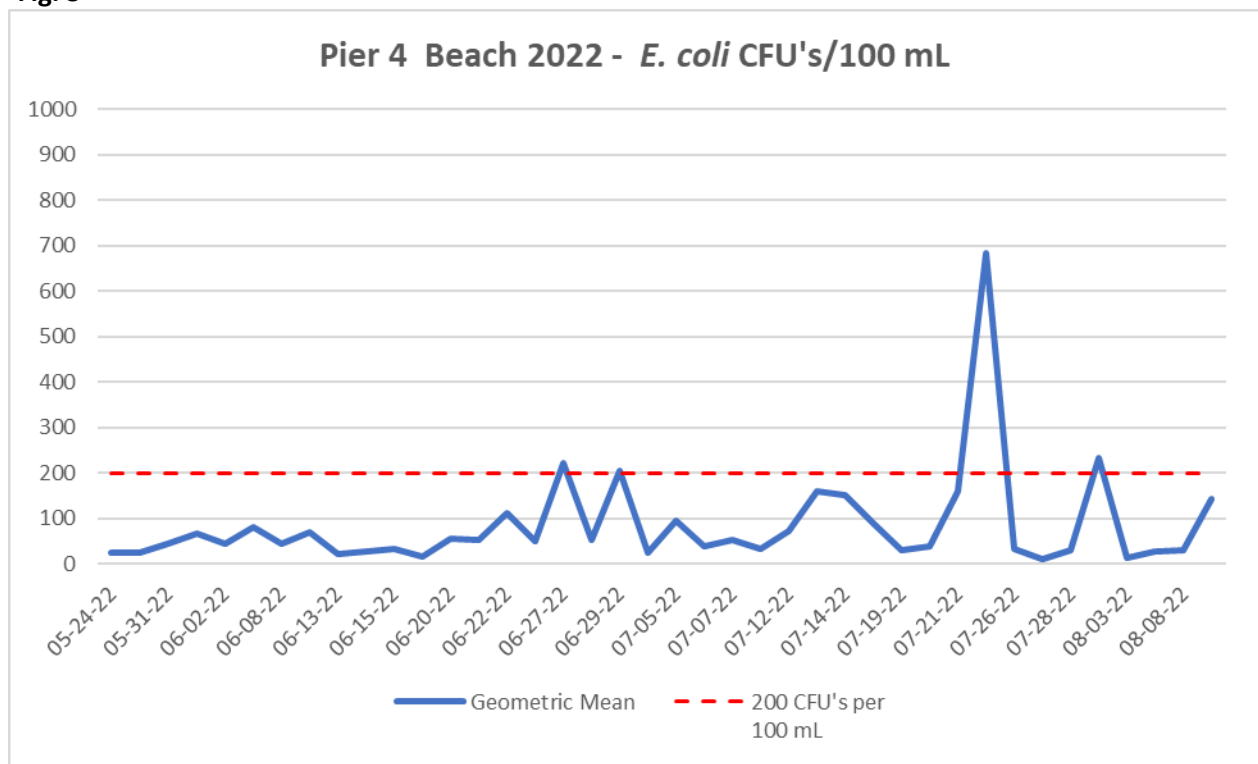


Pier 4 Park Beach

Pier 4 Park Beach was open for swimming 69% of the season in 2022. The beach was posted as either unsafe for swimming due to high levels of *E. coli* bacteria or closed due to toxin-producing BGA for the remaining 31% of the season. Blue-green algae arrived approximately 2 weeks later in 2022 on Aug. 10th, versus July 26th in 2021. This allowed for a longer beach season and contributed to an increase in percentage of days open when compared with the data from 2021. In 2022, the *E. coli* concentration at Pier 4 beach was below or hovered near the threshold of 200 CFUs per 100 mL of water for most of the season, except for a geometric mean of 683 CFUs on July 25th. The beach was also posted on five separate occasions for having a single sample test greater than 400 CFUs per 100 mL (>1000, 880, 650, 500, and >1000 CFUs per 100 mL of water).

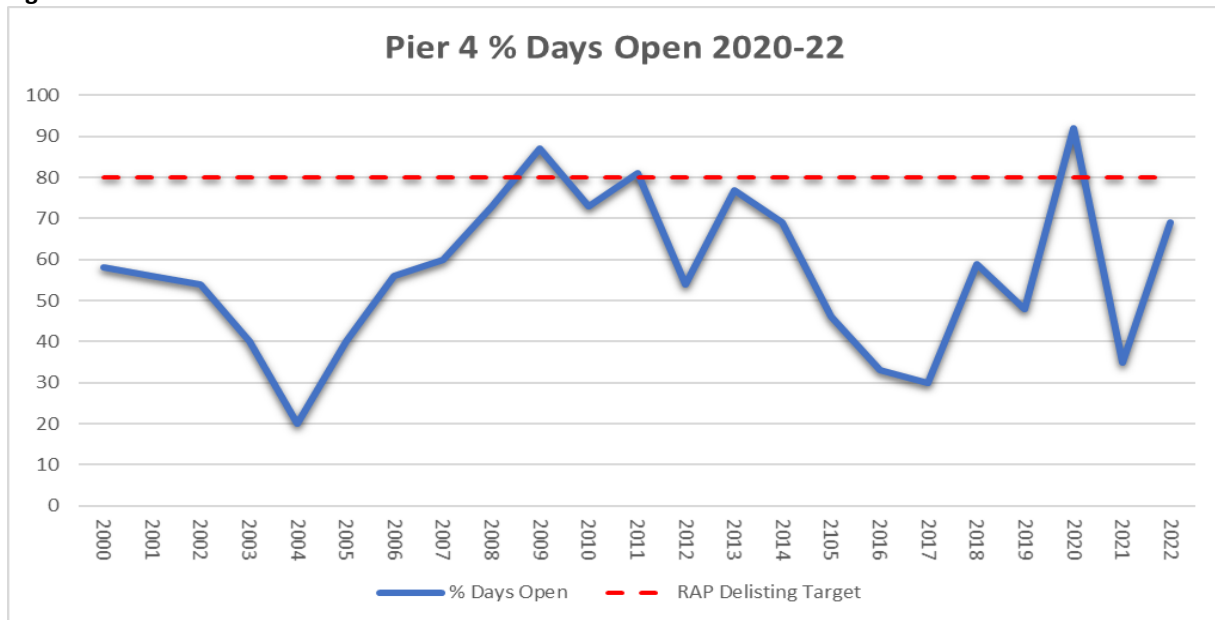
As Hamilton Public Health Services does not monitor for *E. coli* concentrations while BGA is present, it is unknown how many further days the beach would have been posted due to high *E. coli* concentrations had the beach not been closed due to BGA.

Fig. 3



The percentage of days that public beaches are open during the swimming season is an indicator of the recreational quality of the water at Hamilton's public beaches. Hamilton Harbour remains on the Great Lakes Areas of Concern (AOC) List. As a result, stakeholders have developed a Remedial Action Plan (RAP) for Hamilton Harbour to identify the challenges in the harbour and how they may be addressed. One criterion that needs to be satisfied before the Hamilton Harbour can be delisted from the AOC List, is that harbour beaches must be open for swimming 80% of the time during the swimming season. **Fig. 4** below illustrates the percentage of days open at Pier 4 beach from the years 2000-2021 related to the 80% criterion.

Fig. 4



Pier 4 Beach reached a record low of only 20% days open in 2004 which prompted additional research on the issue of bacteriological water quality at Pier 4 Beach and the introduction of bird exclusion measures in 2005. After the introduction of bird exclusion measures the water quality increased each year and percentages of days open continued to increase. Bird exclusion measures have continued to effectively evolve. However, the increasing occurrence of toxin-producing BGA over the last decade has resulted in lengthy closures of the beach and has significantly decreased the percentage of days open. The negative impact of BGA on beach closures can be seen in the above chart when, in 2020 Pier 4 beach was open for swimming 92% of the season – the only year in over a decade in which visible algal blooms were absent for the entire season.

Lake Ontario Beaches

Lake Ontario beaches were open an average of 99% of the season in 2022 (Fig. 1). The water quality at Beach Boulevard, Van Wagner’s and Confederation Park Beaches is historically very good, with beaches consistently open between 90-100% of the time during each swimming season. Swimming advisories are generally rare at Lake Ontario beaches and when they do occur, they are of very short duration, usually lasting only one or two days. Additionally, *E. coli* concentrations are consistently very low, often reported at the minimum reporting level of < 10 *E. coli* CFUs per 100 mL of water. As Public Health Ontario’s minimum reporting level is < 10 *E. coli* CFUs per 100 mL of water, the actual geometric means may be even lower than what is listed below. Lake Ontario also does not typically have water quality problems related to BGA, allowing for a consistent and lengthy swimming season.

Hamilton Public Health services will resume beach water quality monitoring in 2023 immediately following the Victoria Day long weekend and continuing until the Labour Day long weekend.

References

Centers for Disease Control and Prevention (CDC). (2017). *Recreational Water Illnesses*. Retrieved from: <https://www.cdc.gov/healthywater/swimming/swimmers/rwi.html>

Health Canada. Guidelines for Canadian Recreational Water Quality Cyanobacteria and their Toxins. Guideline Technical Document For Public Consultation. Ottawa, ON: Her Majesty the Queen in Right of Canada, represented by the Minister of Health; 2020. Available from: <https://www.canada.ca/en/health-canada/programs/consultation-cyanobacteria-toxins-recreational-water/document.html>

Miller, A and Russell, C. National Collaborating Centre for Environmental Health. (2017). *Cyanobacteria in Freshwater*. Retrieved from: http://www.ncceh.ca/sites/default/files/Cyanobacteria_in_Freshwater-May_2017.pdf

Ontario Ministry of Health and Long-Term Care (MOHLTC). (2018). *Operational Approaches for Recreational Water Guideline*. Retrieved from: http://health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/protocols_guidelines/Operational_Approaches_to_Rec_Water_Guideline_2018_en.pdf

Ontario Ministry of Health and Long-Term Care (MOHLTC). (2019). *Recreational Water Protocol, 2019*. Retrieved from: http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/reference/recreational_water_en.pdf.