HUDSON RIVER PK
RIVER PROJECT

Pathogen Report 2023

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Purpose

Hudson River Park is part of the Community Water Quality Testing Program (CWQTP), a coalition of dozens of boathouses, universities, and community members organized by the Billion Oyster Project (BOP). From May to October, the coalition samples nearly 90 recreational water-use sites across all five boroughs and New Jersey. This community-driven effort seeks to provide accurate, site-specific health and safety data to keep boaters and recreators informed of weekly sewage contamination. Through weekly testing for fecal indicator bacteria of the genus *Enterococcus*, the CWQTP helps to inform tens of thousands of water users each year.

What is MPN?

MPN stands for Most Probable Number of colony-forming units (CFUs) of bacteria in 100mL of water, in other words, the concentration of bacteria. Below 35 MPN is safe for indirect contact, above 105 MPN is unsafe, and between is unsafe if levels persist. New legislation has changed the criterion to assessing 30-day geometric means, which must fall below the 35 MPN threshold.

Key Questions

- How do sewage contamination levels vary each year?
- How does rainfall affect sewage contamination?

Fig. 1 | Filling (left) and incubation (right) of an Enterolert* Quanti-tray*

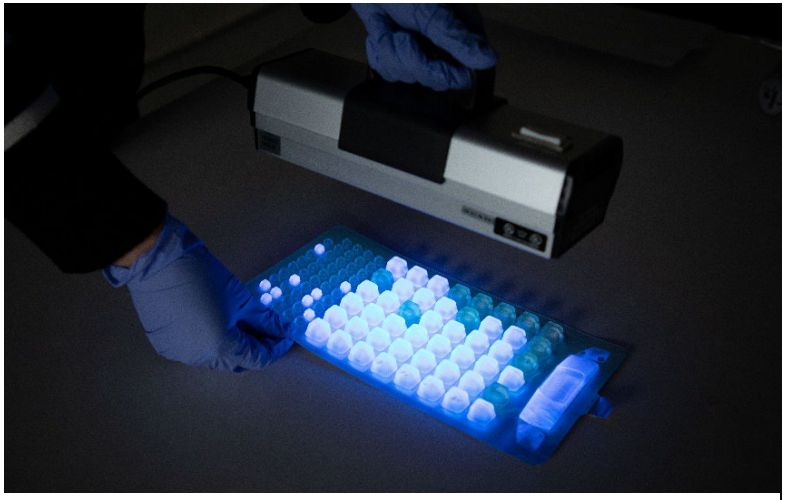

Fig. 2 | One Enterolert* Quanti-tray* with high levels of *Enterococcus* contamination (blue fluorescence)

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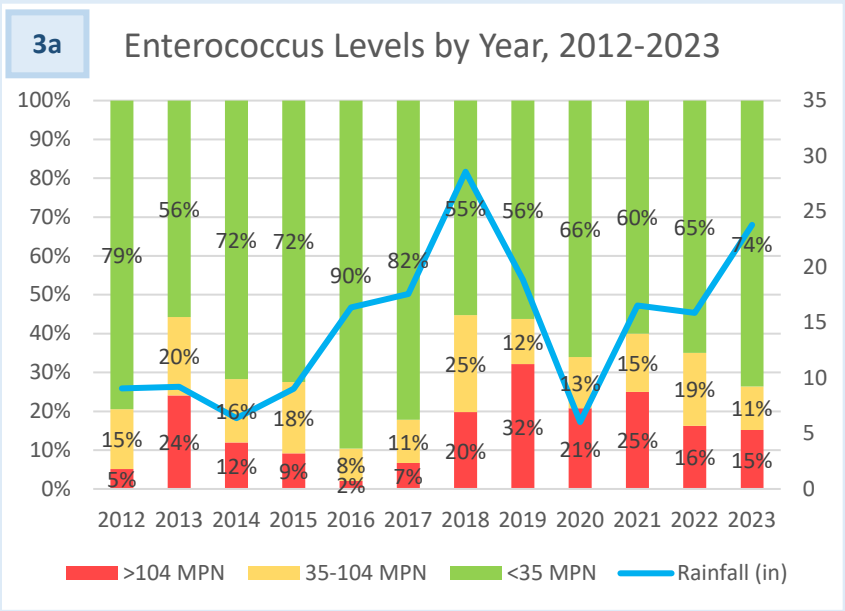
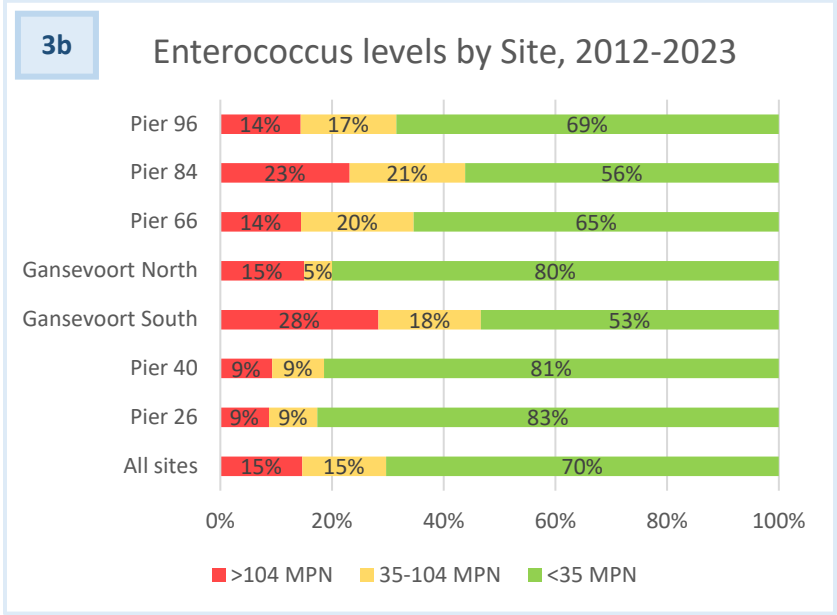
Methods

- Samples from Piers 26, 40, 66, 84, 96, and Gansevoort Peninsula were tested weekly for the presence of *Enterococcus* using IDEXX Enterolert protocols from May to September.
- For the first time, Gansevoort Peninsula was sampled at four different locations: North, South, South-Middle, and South-Ramp. Southern location data were calculated together and treated as one "site".
- *Enterococcus* levels were assessed according to DOH standards.
- Findings were reported to BOP weekly.
- Data analyzed with Microsoft Excel.

Major Findings

Enterococcus levels within Hudson River Park were relatively similar between 2022 and 2023 (**Fig. 3a**).
Piers 40, 26, as well as the North side of Gansevoort exhibited the highest frequency of safe days (~80%), followed by the midtown sites (~60%), and then the South side of Gansevoort (53%), likely due to the peninsula's physical structure reducing water flow (**Fig. 3b**). The North side of Gansevoort features a newly constructed salt marsh. Correlation between the salt marsh and this result is unknown until further data are gathered. See Billion Oyster Project's page for more details on samples from all sites in NYC.





Figs. 3a & 3b | Enterococcus levels in Hudson River Park by year (**a**) and by site (**b**).

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Combined sewer systems, which make up 60% of NYC's sewage infrastructure, are designed to release untreated sewage and rainwater into NYC waterways during precipitation events that exceed the system's capacity. For this reason, rainfall continues to be a primary factor influencing sewage contamination in the Hudson River and New York Harbor. The variability of these fecal contamination spikes is high despite significant overall correlation with rainfall, illustrating the importance of high frequency, site-specific sampling that is often not performed by agencies.

All sites showed significantly higher bacteria levels during wet weather except for Pier 84 (**Fig. 4**). Even 7.5mm (1/3") of rainfall within a few days prior to sampling significantly increases sewage contamination levels ($p < 0.05$). This indicates that mitigating CSO impacts should be a major focus of any water quality improvement measures in the future.

To examine the difference in results between IDEXX Enterolert and traditional membrane filtration, Hudson River Park partnered with the Interstate Environmental Commission (IEC). Duplicate field samples were taken at Pier 26 and Pier 40 which showed little significant difference.

In general, the Park recommends caution when recreating after periods of significant rainfall. Due to the Hudson's strong tides and currents, contamination typically lasts only 24-48 hours before it becomes dissipated and moves out into deeper waters where it is diluted.

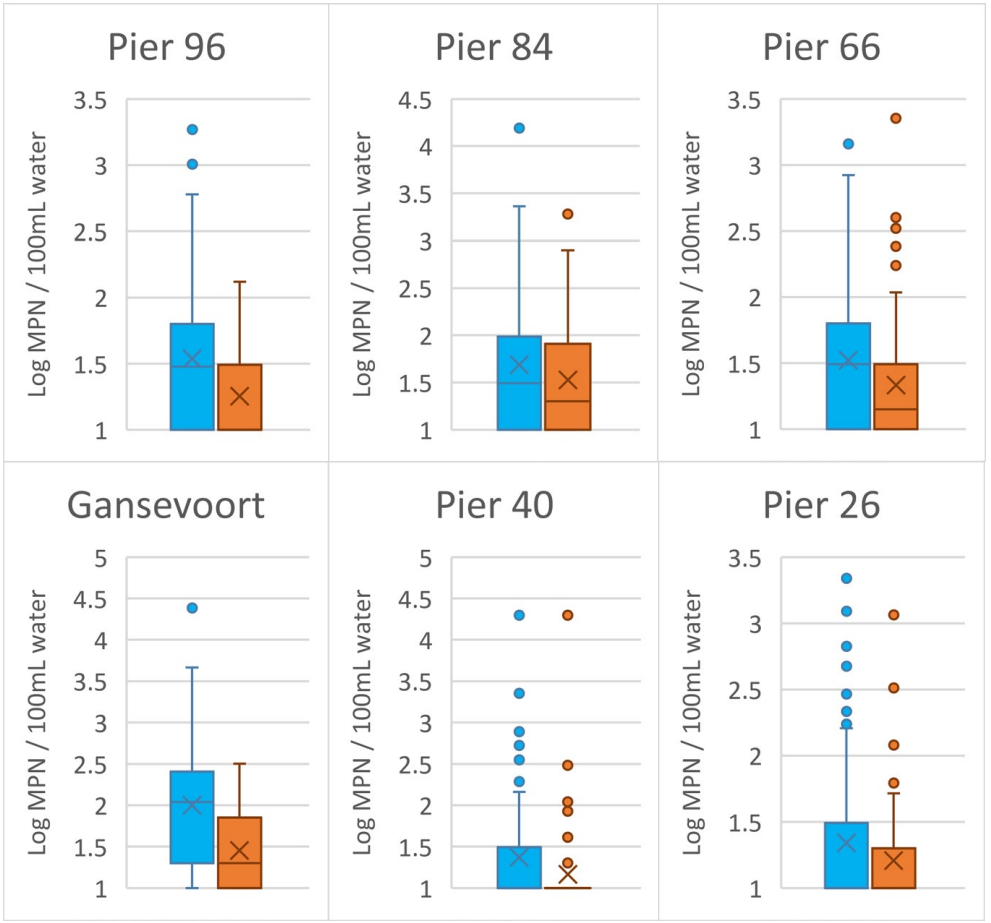

Fig. 4 | Wet vs dry weather *Enterococcus* concentrations in Hudson River Park. Wet weather is defined as >7.5mm of rain within week prior to sampling. Data were transformed to aid in visualization due to heavy right skew of outliers.

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Takeaways

Hudson River Park Trust frequently finds that sites within the Park's bounds show MPN levels in line with EPA recreational standards (<35 MPN) despite presence of multiple CSO outfalls in the park. This is likely due to high flow rates in the Hudson River within the Park. In general, *Enterococcus* contamination is highly variable between years, even month to month, exhibiting high stochastic variation, belying the need for continued, high frequency monitoring, and innovative modeling techniques.

In 2021, Park staff partnered with Columbia University researchers and Cantina Design to produce an easy-to-interpret water quality dashboard based on the pre-existing HRECOS network and high-frequency *Enterococcus* sampling around storm events to produce a model that estimates bacterial contamination based on precipitation (**Fig. 5**). Though any model has its limitations, the daily estimation of risk is on a much finer scale than weekly test results and is intended to further inform park-goers and NYC water-users about up-to-date environmental conditions. View the full dashboard here.

Future Directions

In October 2023, Gansevoort Peninsula completed its construction and opened to the public. Continuing to compare the North & South sides of the peninsula could elucidate potential effects of vegetation such as cordgrass on pathogen levels, if any.

Moving forward, HRPK River Project will continue its participation in the CWQTP to provide robust contamination data for NYC's recreators and water users while gathering information on sewage contamination levels within the Estuarine Sanctuary.

References

Billion Oyster Project (2021). Williamsburg Field Station. https://www.billionoysterproject.org/williamsburg-lab

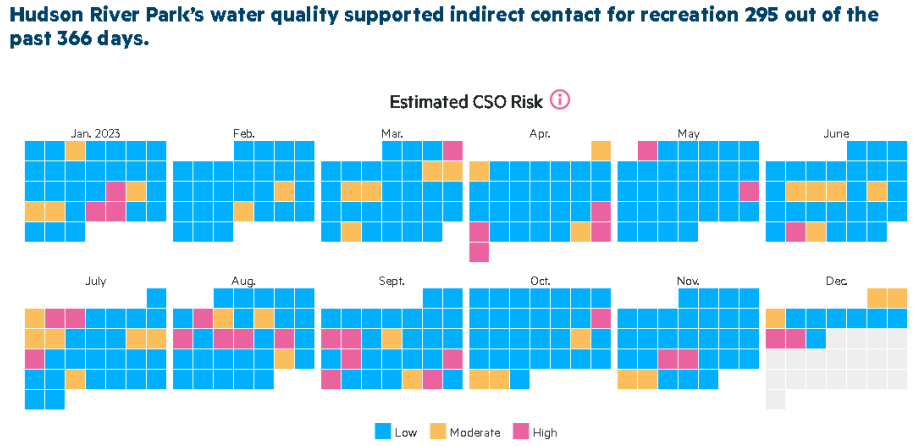

Fig. 5 | Cantina dashboard showing estimated risk of water contact based on precipitation data. Learn more here!