HUDSON RIVER PK

Pathogen Report 2021

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Purpose

Hudson River Park is part of the Citizen's Water Quality Testing Program (CWQTP), a coalition of dozens of boathouses, universities, and community members organized by the New York City Water Trail Association (NYCWTA). From May to October the coalition samples recreational water-use sites in 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 the sewage indicator bacteria 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. It is the concentration of enterococcus in a sample. 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?

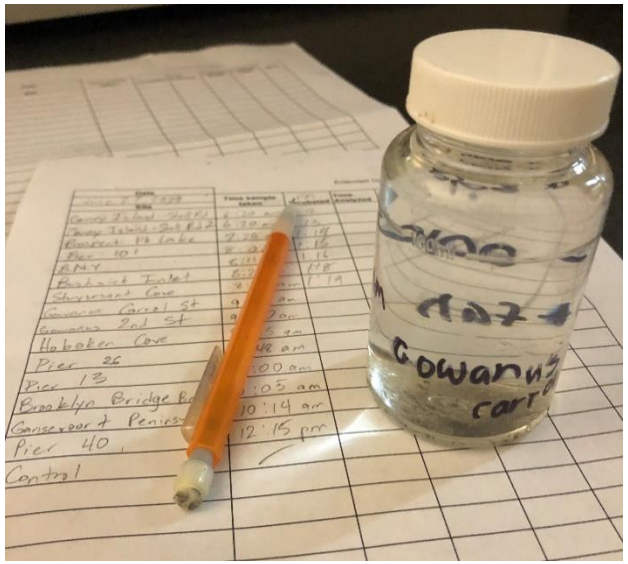

Fig. 1 (above) | Water sample and data sheet
Fig. 2 (below) | Three Enterolert* Quanti-trays* with varying levels of *Enterococcus* contamination (blue fluorescence)

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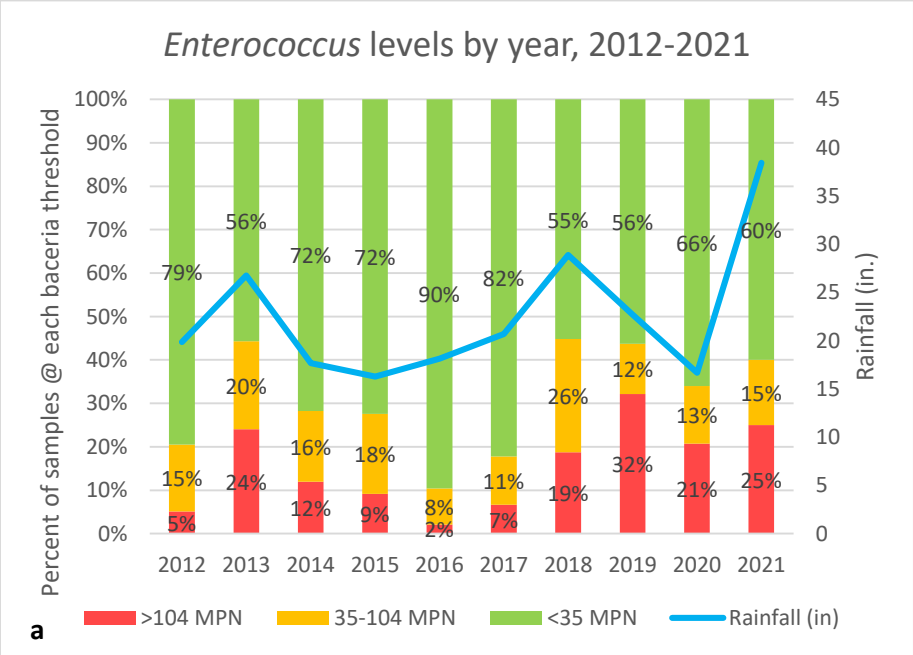
Methods

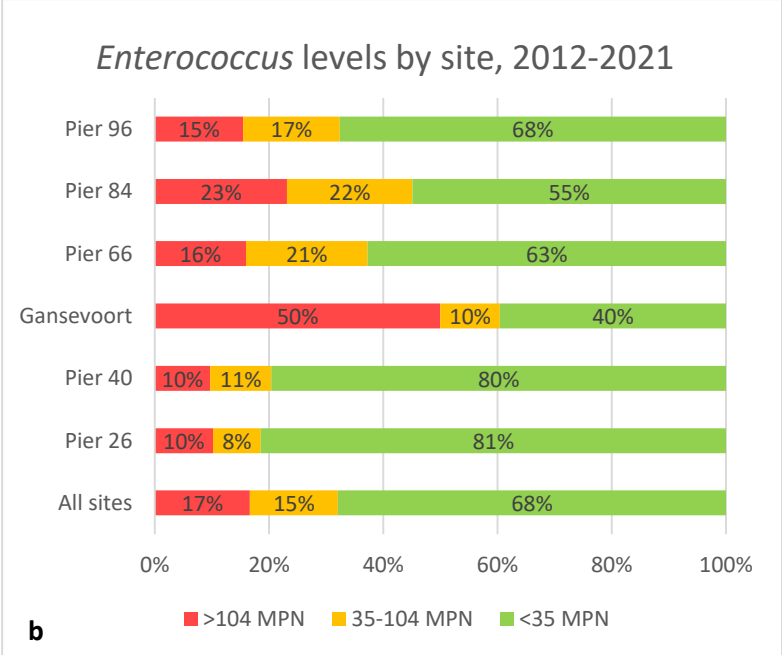
- Samples from Piers 26, 40, 66, 84, 96, and Gansevoort Peninsula were tested weekly for the presence of *Enterococcus* using IDEXX Enterolert* protocols from 5/20 – 9/30.
- *Enterococcus* levels are assessed according to DOH standards.
- Findings were reported to NYCWTA weekly.
- Data analyzed with Microsoft Excel.

Major Findings

Enterococcus levels within Hudson River Park were relatively similar between 2020 and 2021 (Fig. 3). Piers 40 & 26 continued to exhibit highest frequency of safe days (~80%), followed by midtown sites (~60%), followed by Gansevoort (~40%) due to the peninsula's physical structure reducing water flow & combined sewer outfall (CSO) proximity (Fig. 4). The Park exhibited significantly more days of safe recreation standards than NYC overall (p=>0.0001). See https://www.nycwatertrail.org/water_quality.html for more details.

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 correlation with rainfall, illustrating the importance of high frequency, site-specific sampling that is not performed by larger state and federal agencies. All sites showed significantly higher bacteria levels during wet weather except pier 26, which is likely confounded by high outliers despite overall lower average enterococcus concentrations than other sites (Fig. 5).

The data indicate that rainfall significantly (p=0.002) affects sewage contamination levels, and that CSOs should be a major focus of any water quality improvement measures in the future. Monthly geometric means are difficult to properly calculate when there are only 4 data points per 30-day period (1 sample per week). Any high concentrations quickly skew the mean to an extent that would not be seen with more samples.

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.

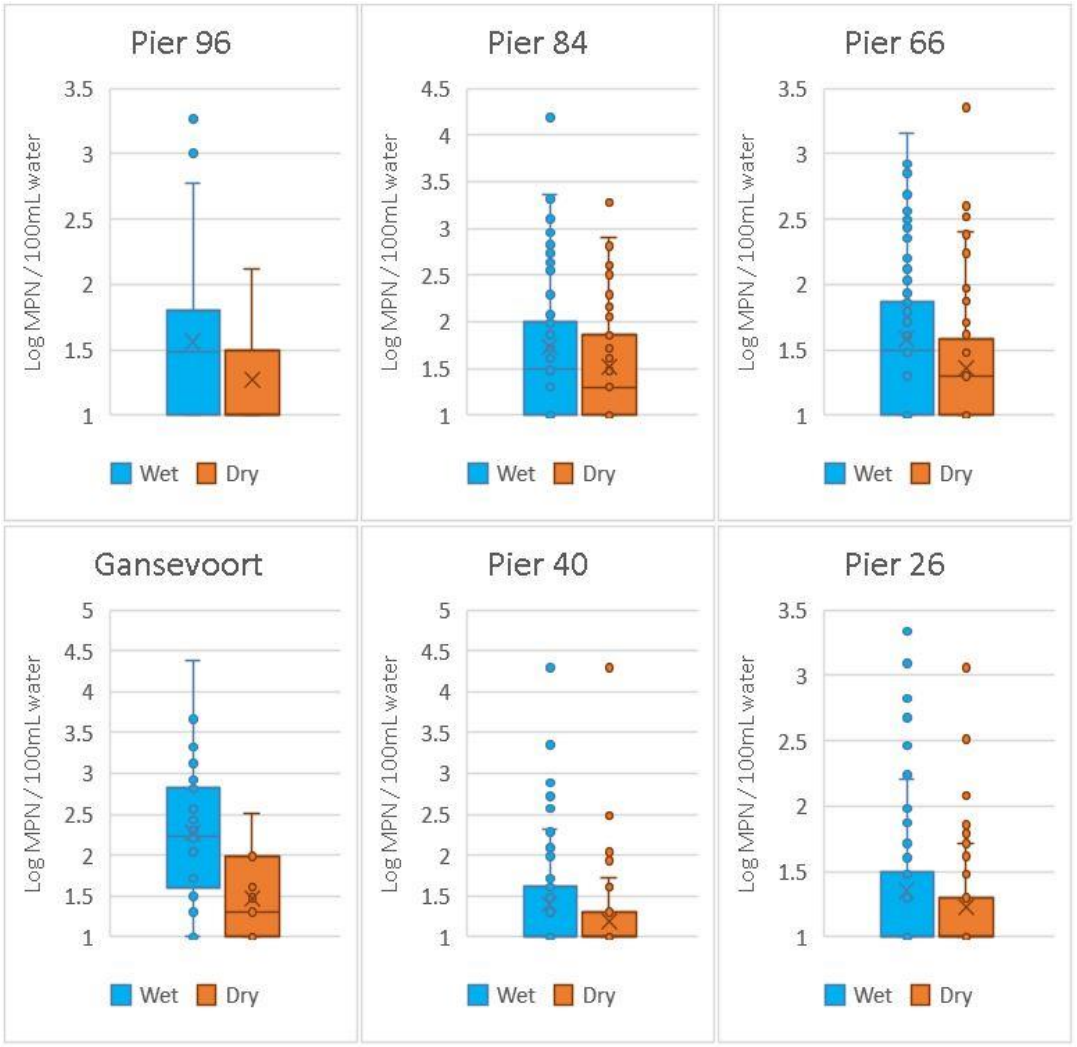

Fig. 5 | Wet vs Dry weather enterococcus contamination. Wet weather defined as >7.5 mm (0.3 in.) of rainfall within 3 days prior to sampling. "X"s indicate mean values. Values were subjected to logarithmic translation to aid in visualization by reducing spread of outliers.

Take Aways

The River Project frequently finds that sites within Hudson River 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.

This year, 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. 6). Though any model has its limitations, the daily estimation of risk is on a much finer scale than weekly test results, and is intended further inform park-goers and NYC water-users of up-to-date environmental conditions. View the full dashboard here.

Future Directions

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.

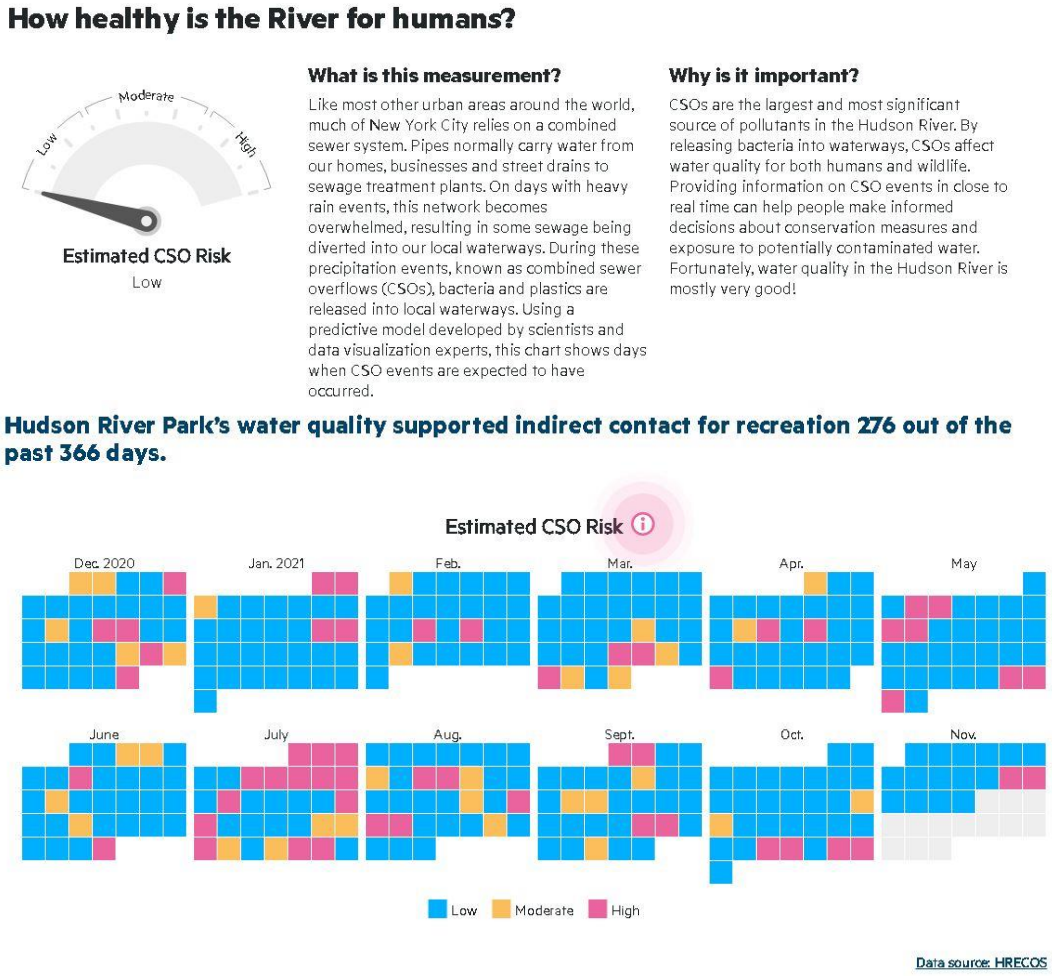

Fig. 6 | Cantina dashboard showing estimated risk of water contact based on precipitation data. Learn more here!