

# EXPLORING NYC SEWER OVERFLOWS

## Citizen science-based water quality monitoring: Constructing a large database to characterize the impacts of combined sewer overflow in New York City

D.J. Farnham, R.A. Gibson, D.Y. Hsueh, W. R. McGillis, P. J. Culligan, N. Zain, R. Buchanan [djf2137@columbia.edu](mailto:djf2137@columbia.edu)

Monitoring water quality in waterways where recreational activity takes place is necessary to detect aquatic and human exposure to harmful pathogens and/or pollutants, including those introduced from combined sewer overflows. This study explores the use of citizen science-based monitoring of fecal indicator bacteria concentrations in waterbodies of the greater New York City area. *Farnham et al. (2017) Sci Total Environ. 580: 168-177*

### Aims

To inform scientific inquiries and to create a data repository to be accessed by water users, the study measured the concentration of the enterococci (ENT), an indicator of human faecal pollution in water, by:

- calculating the percentage of samples that showed levels of ENT above the acceptable threshold for recreation,
- evaluating the seasonality of ENT concentrations at the sites that citizens sampled year-round,
- Investigating whether ENT concentrations sampled after rainy days were higher than those sampled after dry days.

### Approach

Between April 2014 and July 2016, FreshWater Watchers collected 424 water samples from river shorelines across the New York City. Sites were self-selected based on their accessibility and interest of participants.

The water samples collected were sent to the laboratory at Columbia University for screening using two techniques: i) Enterolert from IDEXX Laboratories and ii) Compact Dry ETC Plates from HyServe GmbH & Co. KG.

The results of the screening were cross-referenced with data about the time/date and location the sample was taken from, as well as data on rainfall and temperature.

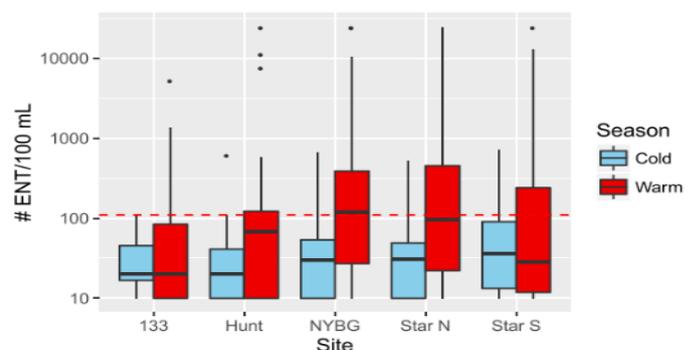
### Impacts

The NYC Department of Environmental Protection only collects water samples in the middle of waterways, not along shorelines where canoeists may be exposed to water as they enter and exit the waterway. This study has demonstrated that citizen science can reinforce the sampling of waterbodies by contributing samples from locations that would not otherwise be monitored while also increasing environmental health awareness among non-scientists, and empowering communities to become involved in management and infrastructure planning.



### Key results

- Elevated ENT concentrations above the recreational water quality criteria were common among many of the sites during the warm season of May through October (31% of the warm season samples exceeded the threshold), and less common during the cold season of November through April (9% of the cold season samples exceeded the threshold).
- The presence of precipitation (at least 7.5 mm) at the Central Park weather station on the day prior to sampling increased ENT concentrations.
- We speculate that the elevated ENT levels following rainy days are a result of combined sewer overflows suggesting that more targeted sampling investigations are needed.



Boxplots of enterococci concentrations for the five sites with at least 10 warm month and 10 cold season samples (blue = cold season, red = warm season). The dotted horizontal line represents the safety standard for contact with the water and the color of the boxplots indicates whether the sample was taken during the warm or cold