

Assessment of Enterococci in Groundwater and Stormwater at the Miami Beach Park View Canal

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Enterococci → Fecal Indicator Bacteria (FIB) used to assess risk of gastrointestinal disease when in contact with water.



MIAMI



Ways to Measure the Sources of FIB

1) By culture (or growth)

If grow, indicates a viable bacteria (cause infection)

Culture required by State for beach monitoring

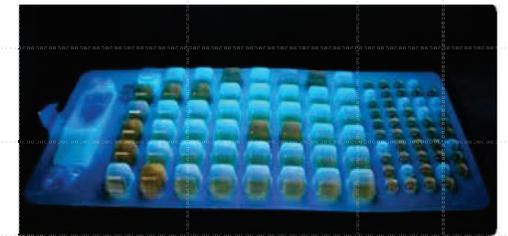
2) By genomic analysis (measure the DNA)

If detected, can be viable or non-viable

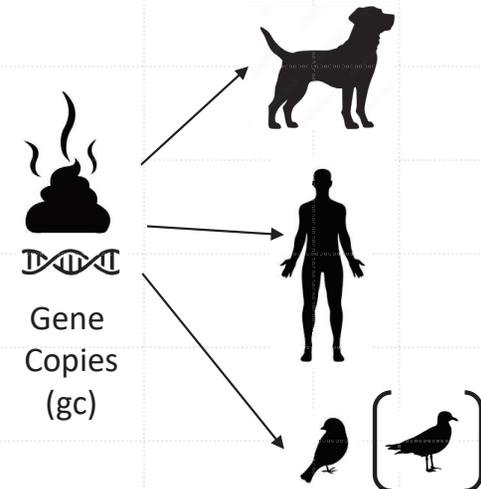
- Measures enterococci (Enterococcus faecalis)
- Measures microbial source tracking (MST) markers
 - Dogs
 - Humans
 - Birds (Gulls)



↓ Viable



Most Probable Number (MPN)



Understanding Regulatory/Guideline Levels

Enterococci

Agency	Purpose	Single Sample Limits (MPN/100 mL)
FDOH	Recreational Beach Use	70
FDEP	Class III (Recreation)	130
US EPA	Primary Contact	130
US EPA	Kayaking turbulent water	164
US EPA	Kayaking calm water	371
US EPA	Fishing	391

REGULATORY FOR BEACHES (NOT DESIGNED FOR CANAL)

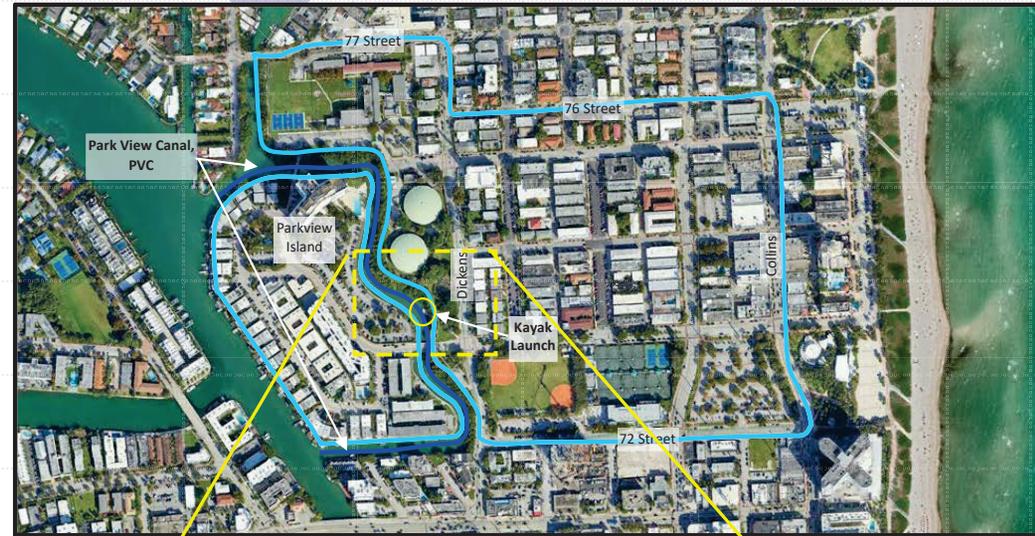
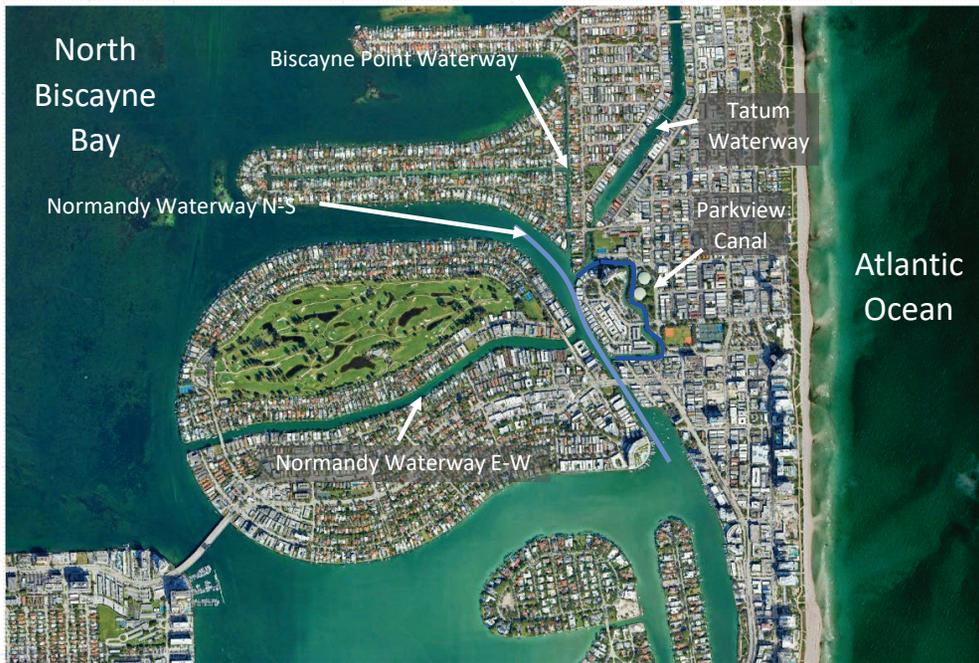
EPA GUIDELINE

MST (Research-based Guidelines for Recreational Beach Use)

Marker	Single Sample Limits (GC/100 mL)
Human	525
Dog	N/A
Bird (Gull)	200,000

RESEARCH RECOMMENDED FOR BEACHES

PVC has Limited Natural Flushing within an Impaired Bay

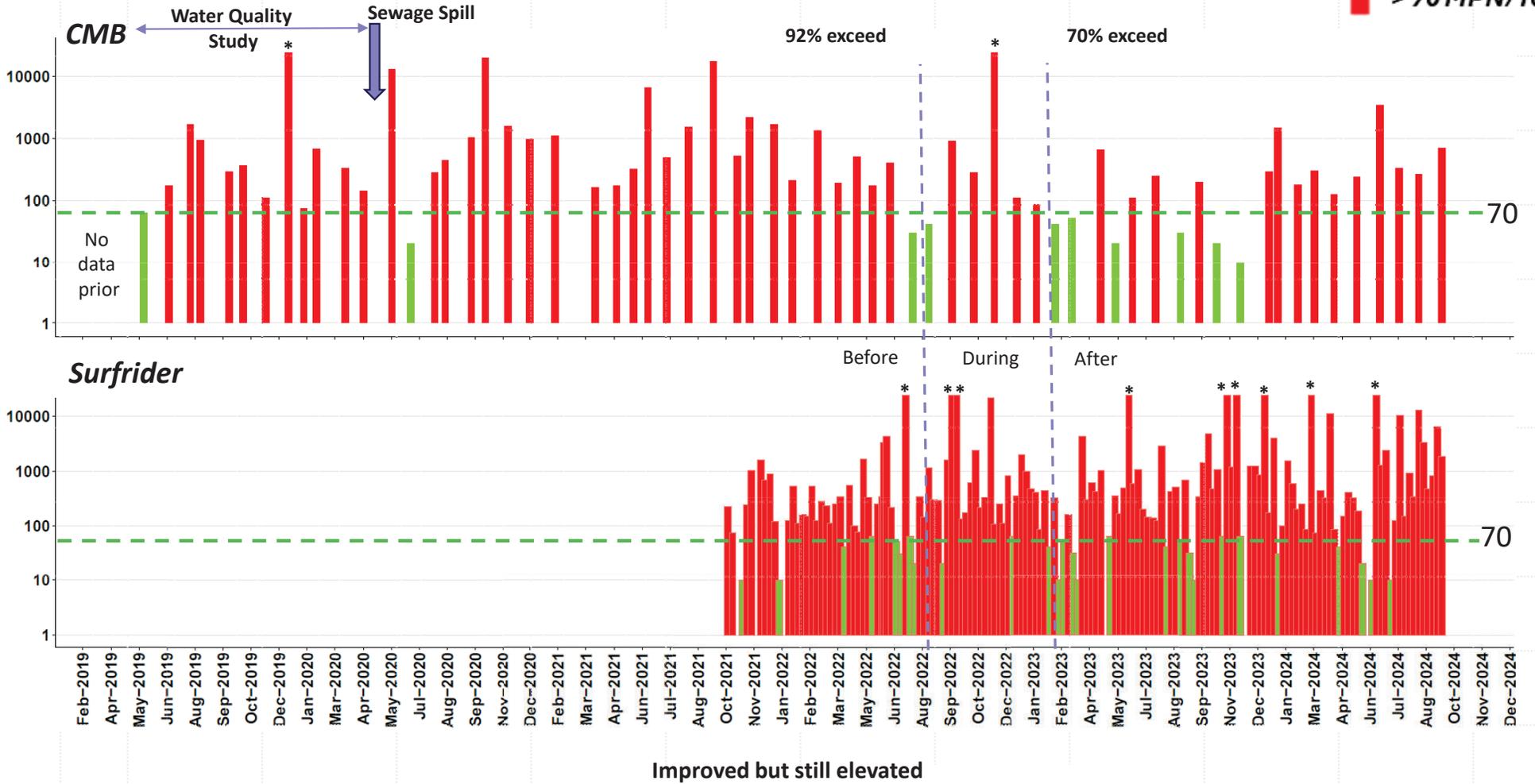


81.3-acre catchment
No first flush treatment

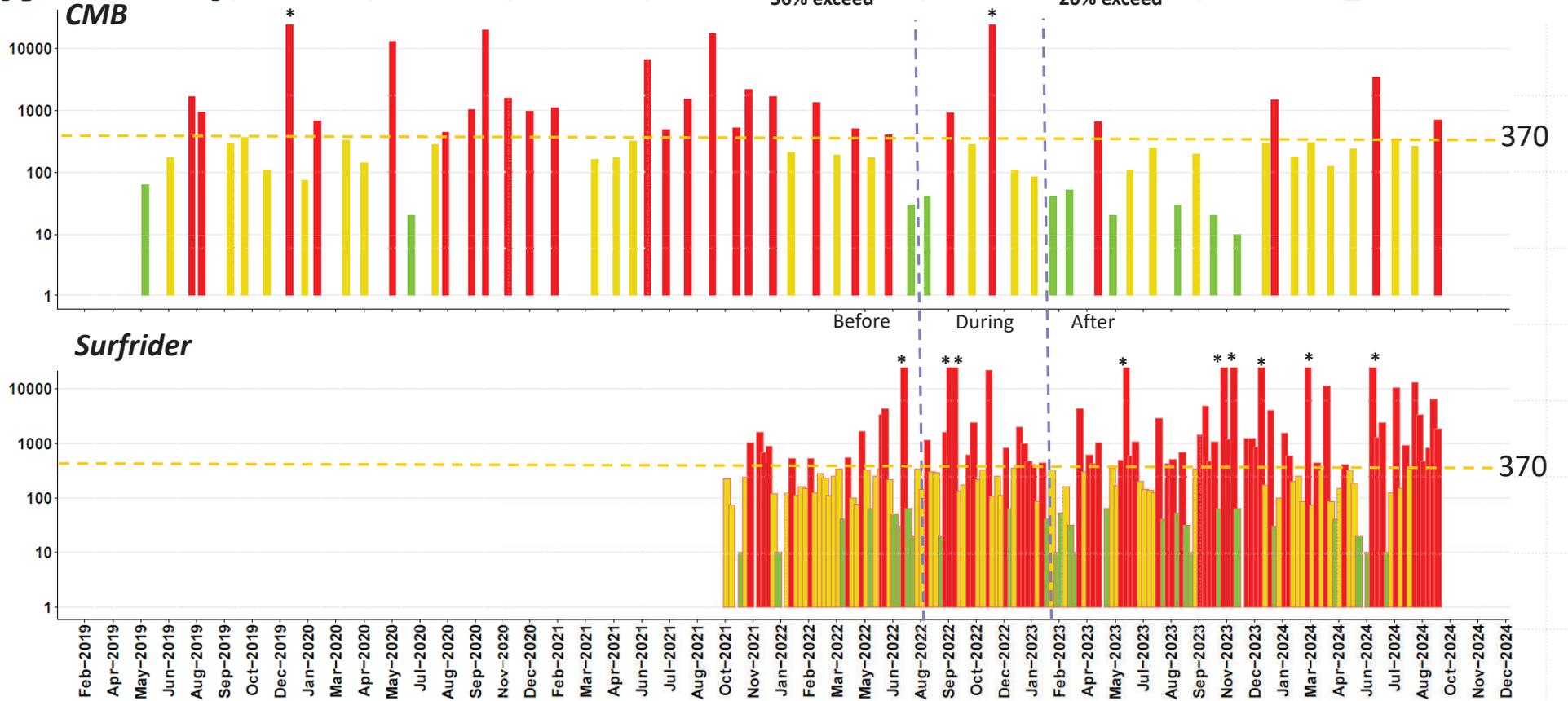
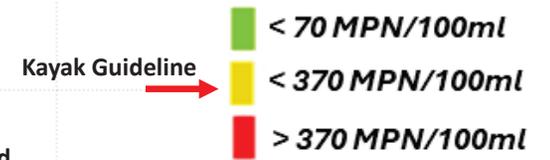


Enterococci elevated in PVC

 < 70 MPN/100ml
 > 70 MPN/100ml

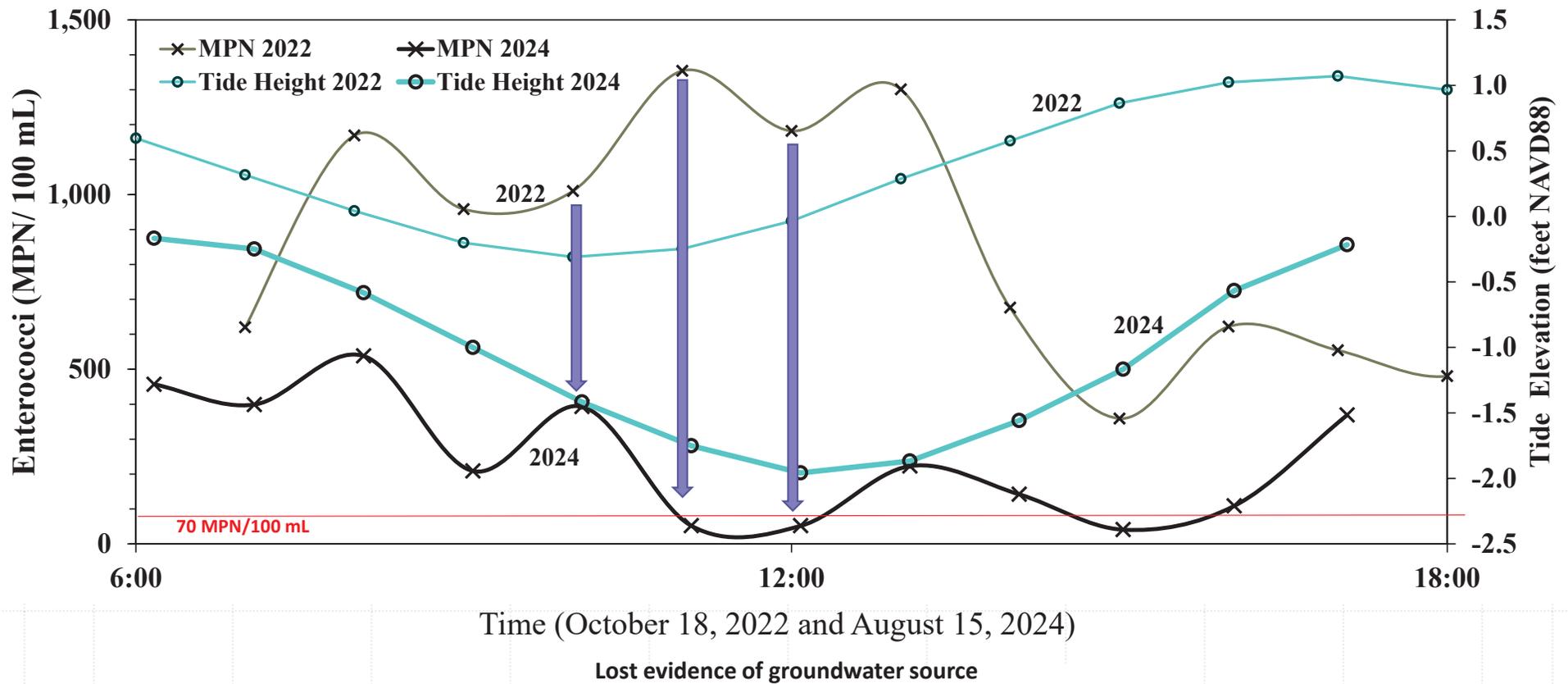


Considering Kayaking Guidelines (yellow)

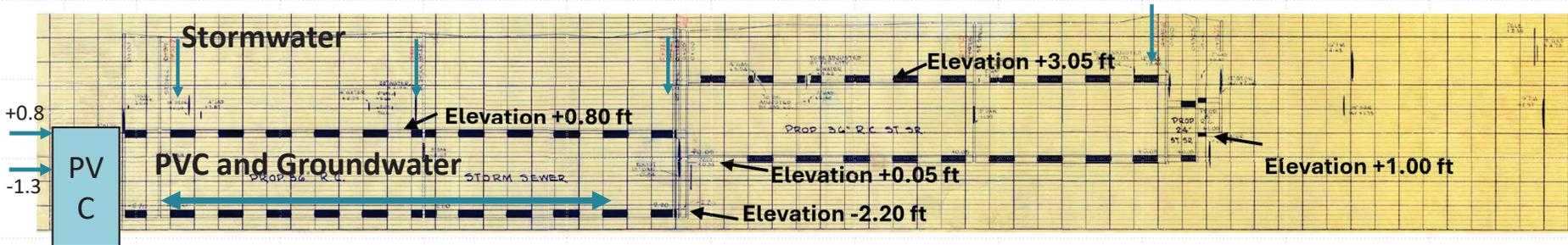


Still elevated above 370, but closer for intended use

Enterococci values dropped significantly b/w storm events, suggesting ARVs and pipe lining have had a positive impact



Prior U Miami study in 2022 → Main water type is from stormwater conveyance system



Section Drawings

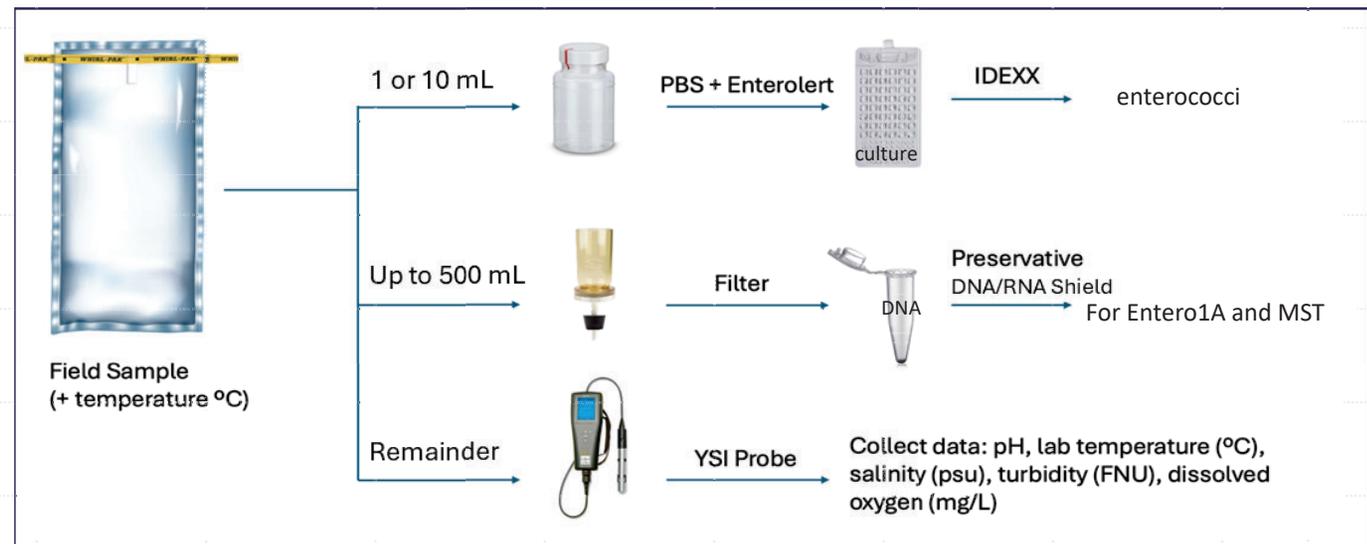
Water in stormwater conveyance system mix of stormwater, groundwater, and PVC water

Objectives: Set up a sampling system that would:

- Separate ground and storm water to better understand the water type (sewer vs. streets)
- Add measurements of MST to identify sources

Measurements by Culture and Genomic Analysis

- Groundwater
- Stormwater
- PVC water
 - Surface
 - 1-foot
 - 5-foot



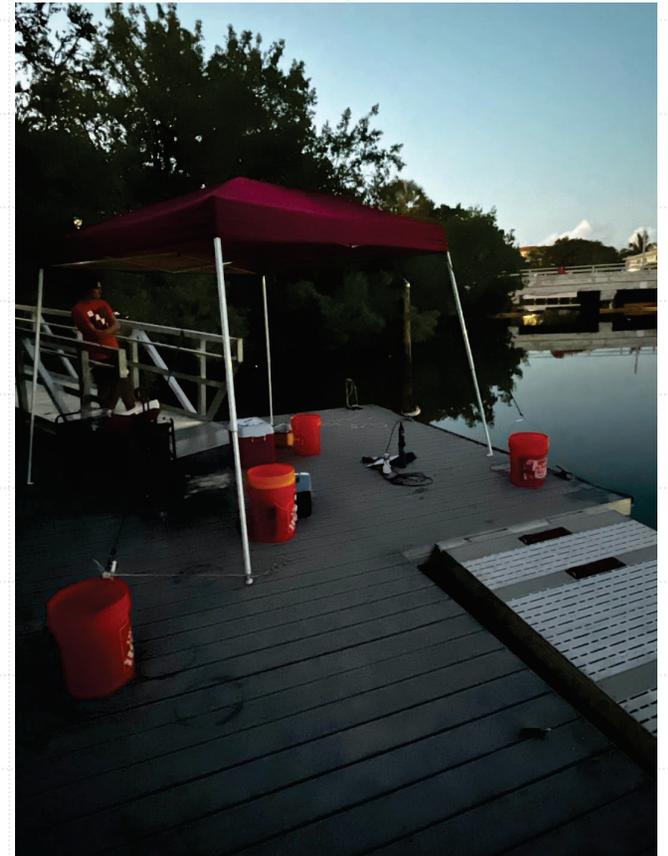
Groundwater



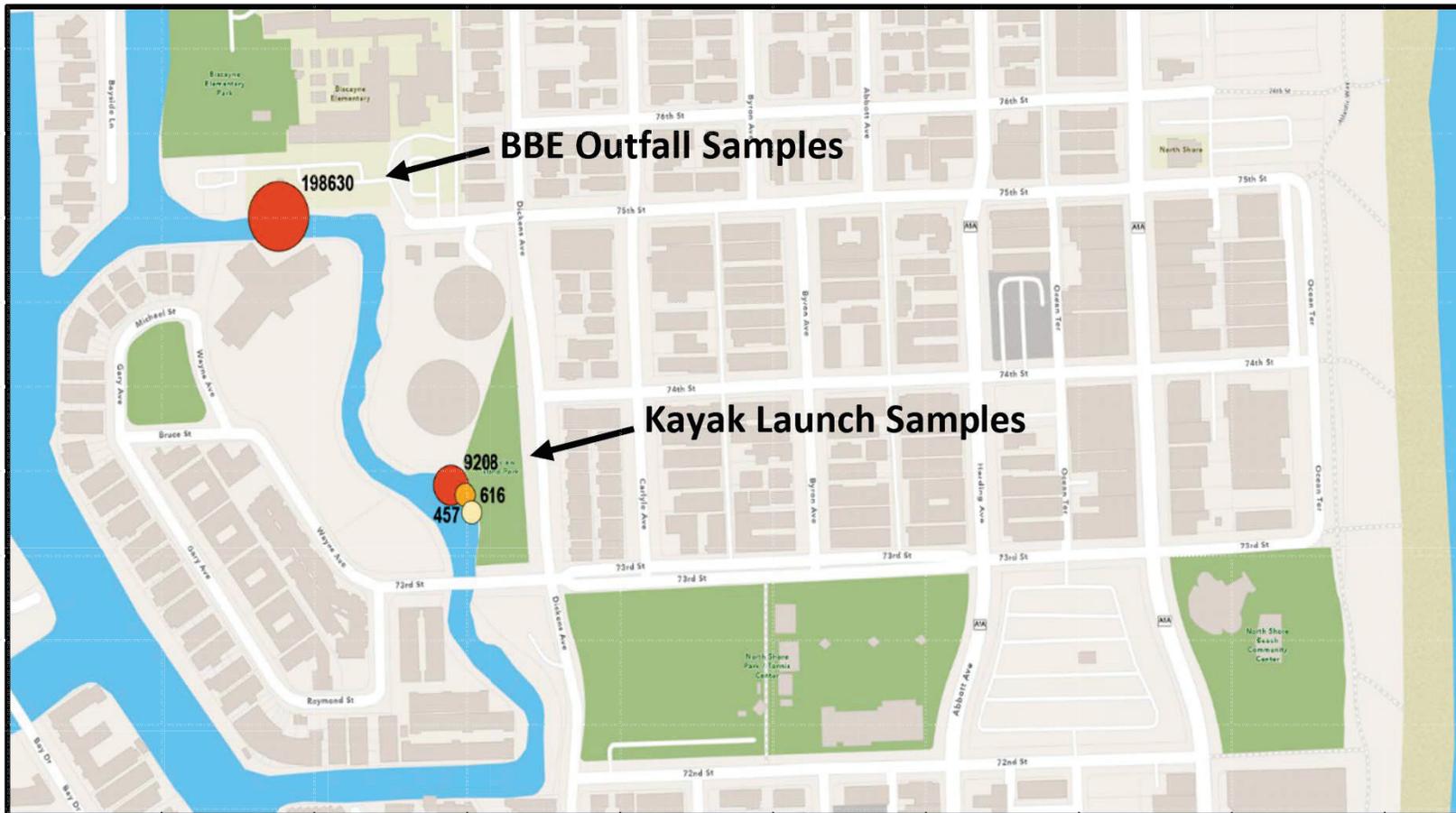
Stormwater



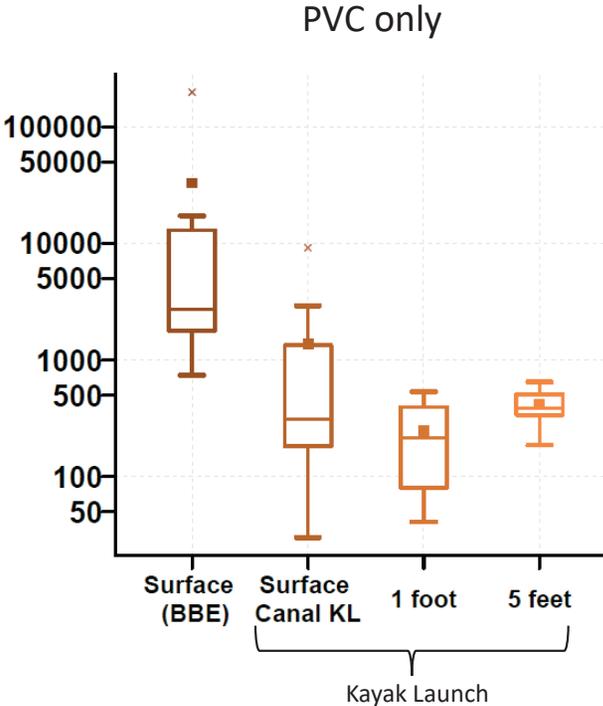
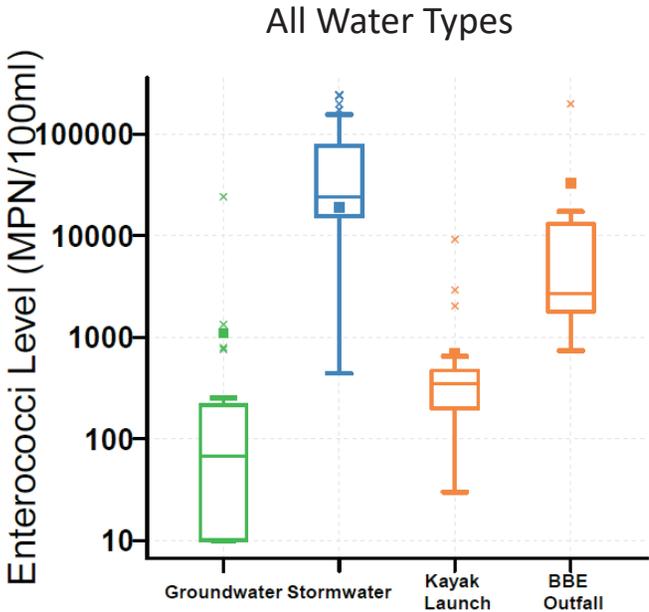
PVC Water



Enterococci in PVC water



Charts below compare the different samples by water type and depth within PVC



UMiami Samples (Enterococci only)

Comparison to other urban environments.

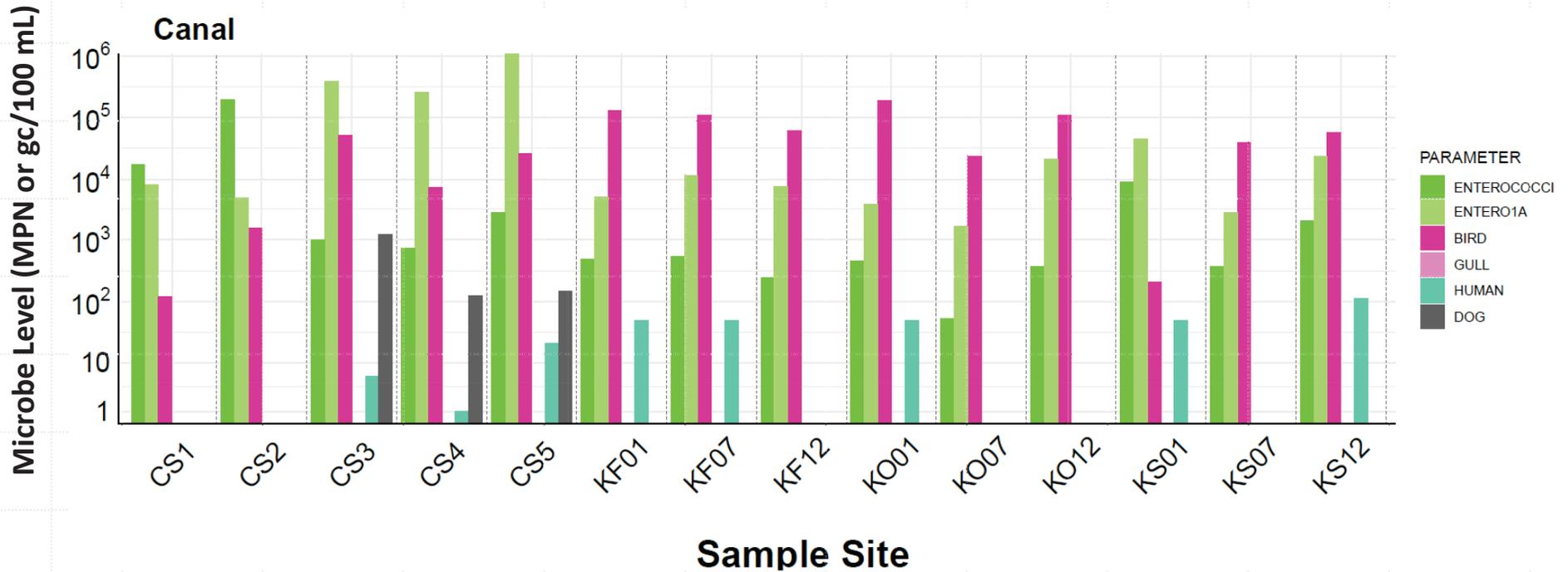
Median is in range/ below available study literature

Environment	Location	Enterococci Median (MPN/100 mL)
Roof runoff	Miami, FL	1,200
Canals impacted by stormwater	New Orleans, LA	4,300
	Norfolk, VA	1,200
	PVC	300
Stormwater (from street)	Houston, TX	10,100
	Raleigh, NC	12,300
	PVC	20,000

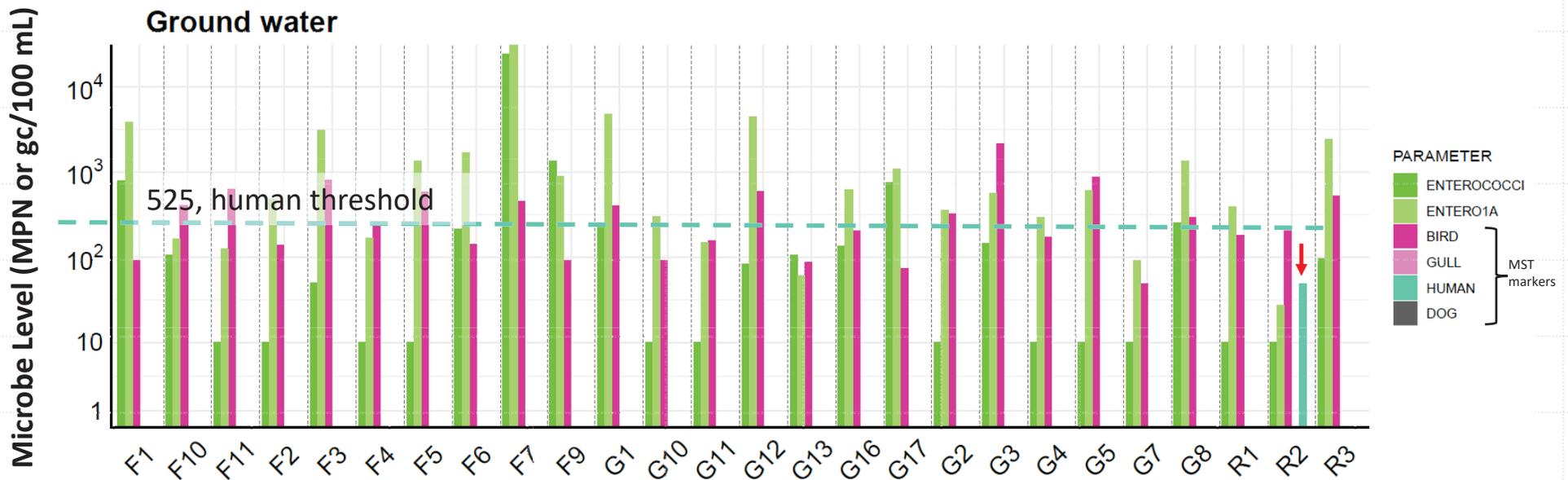


Microbial Source Tracking MST

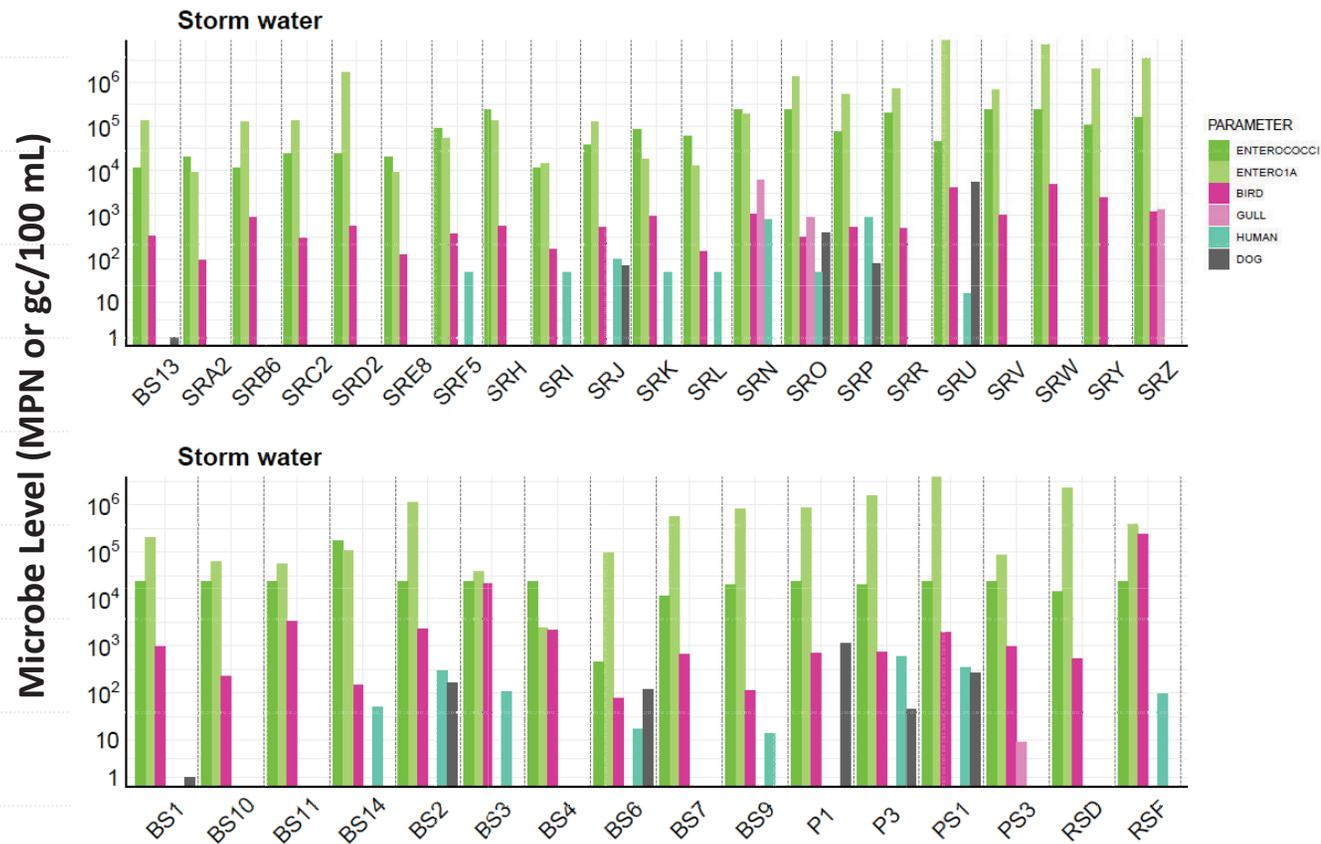
PVC water shows evidence of bird (a lot), some dog and some human



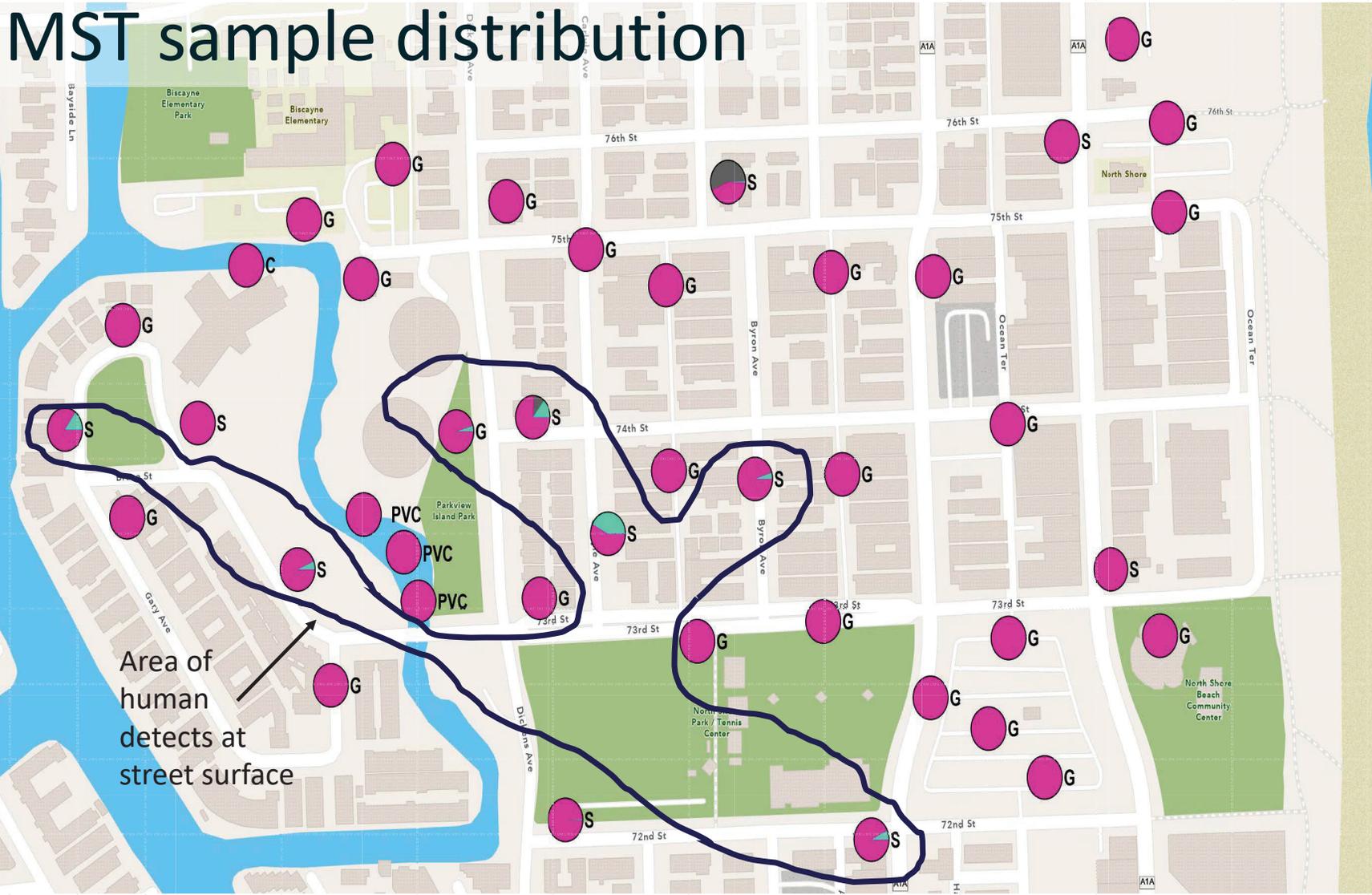
Groundwater shows evidence of bird (due to stormwater and PVC mixing) but no dog and one with very low human



Stormwater showed highest levels of enterococci, dog, and human markers



MST sample distribution



MST Marker Distribution



Sample Label

- G: Groundwater
- S: Storm
- C: Canal
- PVC: Kayak Launch

Conclusions

- Enterococci levels lower between storm events (lost earlier signal of possible sewer leaks).
- Sanitary sewer pipe-lining and repair of air release valves appears to have improved water quality between storms
- **Main water type contributing to enterococci in the PVC is stormwater**
- Source to stormwater comes from birds, humans, and dogs from street runoff
- Additional load from birds within the PVC
- BBE outfall contributes enterococci to the PVC

Recommendations

Stormwater

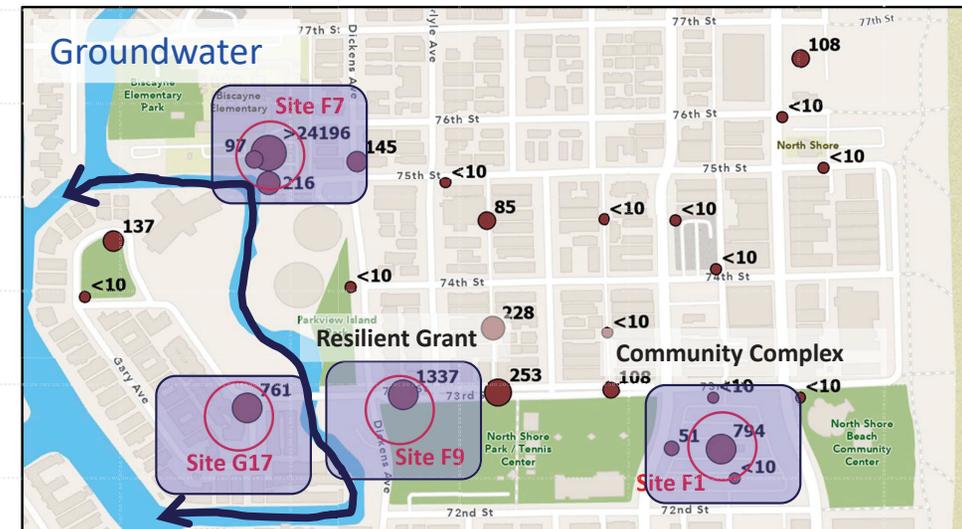
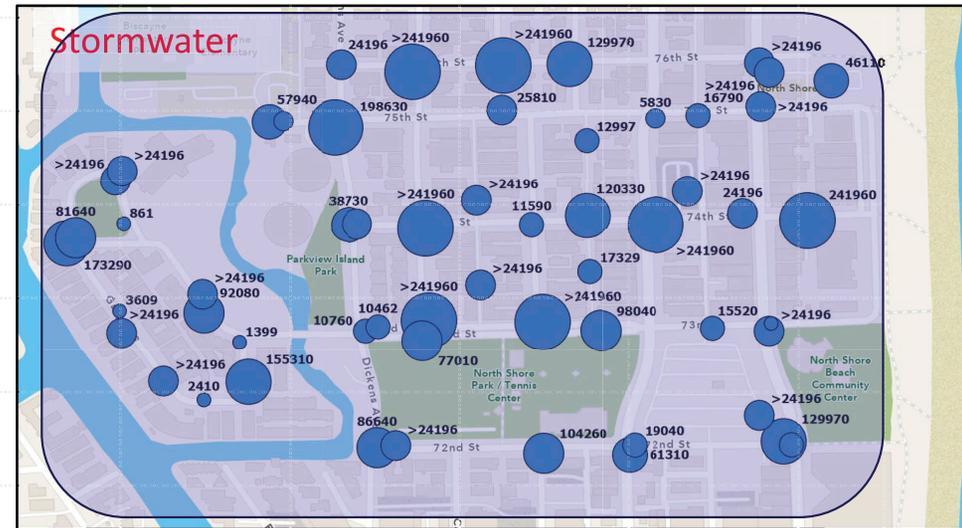
- **Outfalls:** Address outfall at Biscayne Beach Elementary. Miami-Dade should investigate private outfalls contributing to PVC.
- **Street Sweeping:** Increase frequency on east side of catchment. Improve street sweeping access (add smaller units).
- **Cleanliness of Public Spaces:** Deep clean grassy areas and surfaces with visible animal waste. Explore UV disinfection.
- **Pet Waste:** Continue public education campaign. More pet waste stations. Deep clean up of pet waste.
- **Address Homeless Sanitation Practices and Needs:** Explore ways to improve access to sanitation.
- **Birds:** Evaluate what is attracting birds to PVC and throughout catchment

Groundwater

- Continue with aggressive inspection and maintenance of sanitary sewer

PVC

- Implement water quality treatment for stormwater outfall improvements
- Improve PVC flushing (in design and permitting phase)
- Improve shoreline to reduce erosion and trash (federally funded living shoreline)
- Consider EPA kayaking guideline (370 MPN/100 mL) coupled with a weather based pre-emptive closure



Thank you!

- Next steps
 - Release report to general public in March.
 - Integrate feedback from public into report.