
REPORT TO BALLYHOO MEDIA

WATER QUALITY MONITORING PILOT PROJECT



MIAMI
WATERKEEPER®



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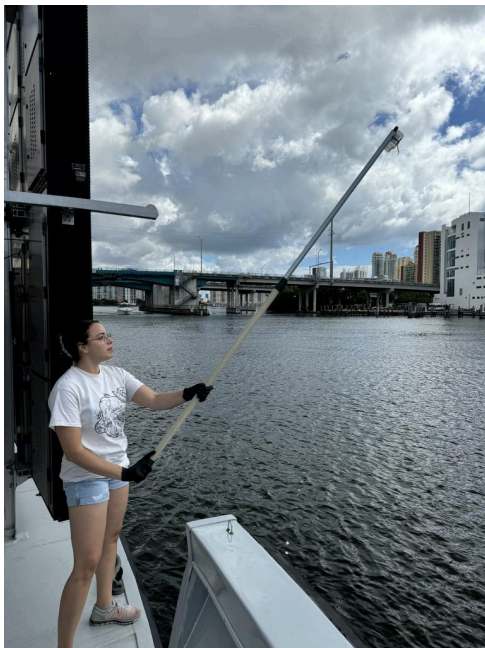
EXECUTIVE SUMMARY

Miami Waterkeeper partnered with Ballyhoo Media to analyze bi-weekly water quality samples at three sites during a three-month pilot project (April 2024 - July 2024). Ballyhoo Media staff collected water samples by boat and transported them to the Miami Waterkeeper laboratory for analysis. The results were made available to the public through the Swim Guide app, enabling informed decisions about potential health risks in these recreational areas.

Fecal indicator bacteria (FIB), such as enterococci, are derived from the gastrointestinal tracts of warm-blooded animals and are often associated with pathogens and viruses common in fecal material. Although enterococci bacteria do not necessarily cause illness, their presence can indicate a higher risk of exposure to harmful pathogens. These bacteria can originate from various sources, including human sewage, pets, and wildlife, or bloom independently by utilizing excess nutrients and stable substrates along waterways. When enterococci levels exceed 70+ CFU/MPN per 100 mL, the Florida Department of Health (DOH) advises that contact with the water may pose increased health risks.

While enterococci is a useful metric for health-related water quality, its presence is often a symptom of broader water quality issues, making routine monitoring vital. High enterococci levels at a site can indicate nearby sources of contamination, such as stormwater runoff or sewage leaks.

The data collected over the three months contributes to our overall understanding of water quality trends within Biscayne Bay. Notably, 20% of the samples collected by Ballyhoo Media did not meet the criteria for recreational waters.



HIGHLIGHTS FROM WATER QUALITY MONITORING

- 25 total water samples were collected and analyzed for FIB, dissolved oxygen, water temperature, salinity, turbidity, and chlorophyll-a.
- 5 samples (20%) exceeded the DOH recommended FIB threshold for public recreation.
- 419 total Swim Guide views were recorded, with the Beach at Oleta River State Park being the most popular site.

INTRODUCTION

Florida's economy thrives on its pristine waterways, which are the top attraction for tourists, contributing \$112 billion annually and employing nearly half a million people in the state's ocean economy. South Florida's waterways, however, are particularly vulnerable to pollution due to low elevation, porous limestone geology, aging infrastructure, and the ongoing threat of sea-level rise. Without clean waterways, Florida's tourism, job market, recreation, environment, and cultural identity are all at risk.

Despite the importance of water quality, relatively little data is available to residents and visitors who use these waters for recreation. The Florida Department of Health (DOH) monitors Fecal Indicator Bacteria (FIB), but the data is limited, focusing mainly on beaches rather than nearshore and inland locations within Biscayne Bay.

Thanks to the support and partnership of Ballyhoo Media, Miami Waterkeeper has expanded the availability of FIB data to include four additional sites in Northern Biscayne Bay that were previously unsampled. Ballyhoo Media, a local leader in water-based advertising and community engagement, funded and facilitated this sampling through their Blue Beacon program. This initiative uses revenue generated from their advertising platforms to invest back into the community, championing environmental technologies and conservation efforts.

Ballyhoo Media's Blue Beacon program is a testament to their commitment to ocean conservation. Through innovative and sustainable practices, they aim to offset carbon, support environmental tech, and enhance community engagement. Their efforts extend beyond advertising, embracing a holistic approach to environmental stewardship.

By gathering baseline data about water quality at these new locations, we can better inform the public and contribute to the long-term health of Biscayne Bay. This report summarizes the data collected during a three-month pilot study at these three recreational sites and one monitoring site in Northern Biscayne Bay.



ABOUT MIAMI WATERKEEPER

As a Miami-based non-profit organization, Miami Waterkeeper is dedicated to protecting South Florida's coastal waters and the surrounding watershed. Launched in 2010, Miami Waterkeeper has become a leading advocate for clean water, inspiring a movement of empowered citizens dedicated to achieving swimmable, drinkable, fishable water. Often tackling issues on multiple fronts, we address environmental, social, and policy water issues using community outreach, scientific research, and civic and legal action.

Miami Waterkeeper defends the public's right to use and enjoy clean water by focusing on clean water, ecosystem protection, and sea-level rise readiness in South Florida.

Miami Waterkeeper's jurisdiction spans a watershed that serves more than five (5) million people across Miami-Dade and Broward counties and encompasses the mid-section of the Florida Reef Tract. As part of our science and research platform, our water quality monitoring program samples 33 locations weekly in Miami-Dade and Broward Counties to determine the level of the fecal indicator bacteria (FIB) enterococci and the safety of the waters for swimming or other activities and immediately share the results with the public.



ABOUT THIS PROGRAM

The water quality monitoring contract between Miami Waterkeeper and Ballyhoo Media was initiated in April 2024, to incorporate monitoring at three locations, focusing on areas of high recreational value. The project was designed as a three month pilot study to allow.

At the bi-weekly sampling sites, concentrations of the fecal indicator bacteria (FIB) enterococci were collected, along with parameters such as dissolved oxygen (DO), chlorophyll a, salinity, turbidity, and temperature. Sample collection, processing, and analyses were performed under protocols consistent with those used by the Florida Department of Health (DOH)'s Florida Healthy Beaches Program.

The aims of the contract were to:

- ◆ Provide bi-weekly water quality monitoring at three Biscayne Bay sites
- ◆ Inform the local community about water quality monitoring results

Swim Guide

Miami Waterkeeper publishes their water quality testing results, along with the water quality testing information produced by the state DOH for Broward County beaches via the Swim Guide application. All of the most recent water quality monitoring results are available to the public for easy access.

The app utilizes an easy-to-read format, with green indicating good water quality (0-70 CFU/MPN enterococci per 100 mL sample) and red indicating poor water quality (71+ CFU/MPN enterococci per 100 mL sample).

Site Descriptions:

Keystone Marina - Ballyhoo Media

Keystone Point Marina provides boaters with convenient access to Biscayne Bay's tranquil waters. Ideal for launching boats and paddleboards, it offers easy entry to explore nearby waterways and enjoy a day on the water.

Beach at Oleta River State Park (Oleta Beach) - Ballyhoo Media

This sandy beach, located at Oleta River State Park, is a popular destination for visitors. Beachgoers can enjoy swimming, snorkeling or tanning. Amenities and access for kayakers and paddlers are available. Visitors will see a great variety of wildlife on open water and in shaded mangrove tunnels.

Oleta River & NE 163rd St (Oleta Open) - Ballyhoo Media

At the mouth of the Oleta River, where it meets Biscayne Bay, the mix of fresh and saltwater creates a vibrant spot perfect for boating and paddleboarding. The calm waters and rich marine life make it a popular destination for both recreational and avid boaters.

Sandspur Island - Ballyhoo Media

Sandspur Island, also known as Beercan Island or Racoon Island, is a beachgoer's paradise with calm, clear waters ideal for relaxing, swimming, and exploring. Its secluded beaches and lush surroundings offer a perfect escape into nature. It is the largest spoil island in Biscayne Bay and is part of the Oleta River State Park. The island is only accessible by boat or Kayak, and is a popular destination for weekend recreation.

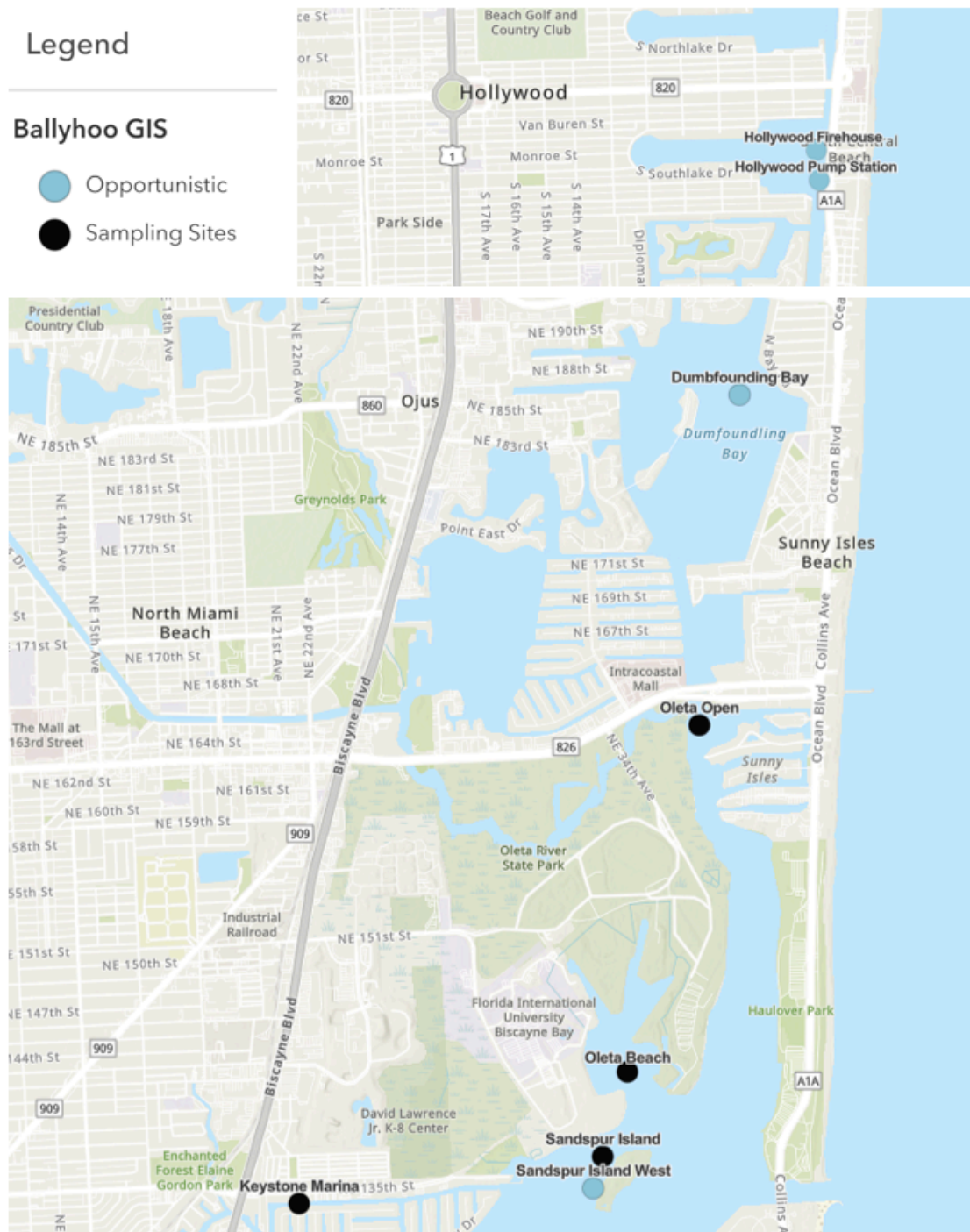


Figure 1. Map of the sites that were monitored for water quality by Ballyhoo Media. All monitoring was sponsored by Ballyhoo Media.

METHODS

This monitoring program implemented Miami Waterkeeper's fecal indicator bacteria (FIB) monitoring protocols at three recreational sites and one monitoring location. Sample collection occurred bi-weekly over the course of a three month pilot project. Valuable and accessible sites were identified during the first two sampling events.

Miami Waterkeeper uses the IDEXX system for routine sampling collection and enumeration of the FIB enterococci present in water quality samples. The IDEXX system only presents results as whole numbers. Prior to collecting samples, precautions are taken to ensure that sampling bottles are sterile; this includes using an autoclave to sanitize the bottles of any bacteria or impurities with heat and pressure. Gloves are always used when handling the samples so they do not become contaminated. Samples are collected approximately 6-12 inches below the surface to best capture conditions where recreational activities take place. Samples are immediately (within 15 min of collection) placed on ice for preservation.

IDEXX trays containing the water sample and the IDEXX enterolert reagent are placed in an incubator for 24-28 hours and then analyzed under UV light for the Most Probable Number (MPN).

Sample collection, processing, and analysis protocols are based on the EPA Method 1600 protocol and the Florida Department of Health (DOH) standards for enterococci. This protocol is also modified to also meet the protocols established by the Florida Department of Environmental Protection (FDEP): FQ 1000, FS 1000 and FT 1000. The field technicians include recent graduates and students from local universities who are trained in collecting field samples, sample processing, and laboratory analyses.

Enterococci Criteria

The following are the EPA-recommended enterococci criteria that the DOH uses to determine quality of the water:

- 0-35 MPN/CFU enterococci per 100 mL sample: **Good**
- 36 - 70 MPN/CFU enterococci per 100 mL sample: **Moderate**
- 71+ MPN/CFU enterococci per 100 mL sample: **Poor**

Swim Guide utilizes an easy-to-read format, with green indicating “good” water quality (<70 MPN/CFU per 100 mL sample) and red indicating “poor” water quality (>70 MPN/CFU per 100 mL sample). Enterococci results that fall within the “moderate” range are reported as “good” on Swim Guide.

Field Collections and Chain of Custody Quality Control

For each sampling batch, a field blank and site replicate sample is collected to assess field collection and sample handling techniques. A temperature control bottle accompanies each sampling batch to ensure samples are properly preserved (< 6°C) throughout the process. Lab technicians undergo audits in the first month of independent sampling and every six months thereafter, with random audits possible at any time. Images of the site accompany each sample to ensure data integrity.

In this pilot study, Ballyhoo Media staff were trained by the Miami Waterkeeper Research Manager to collect and handle water samples. All supplies were provided by Miami Waterkeeper. Samples were transported to the Miami Waterkeeper Laboratory by Ballyhoo personnel and chain of custody protocols were followed.

Laboratory Quality Control

Every batch includes a laboratory blank to evaluate aseptic technique, laboratory sanitation practices, and equipment sterility. Laboratory technicians undergo audits in the first month of independent analysis and every six months thereafter, with random audits possible at any time. Images of IDEXX trays under UV light accompany each sample for analysis.

Environmental Data

We use a multiparameter datasonde to collect water temperature, dissolved oxygen, salinity, turbidity, and chlorophyll immediately after each sample collection. We record observational data on environmental conditions such as weather, tide, temperature, and rainfall. Wind speed and air temperature data are sourced from the AccuWeather app, which pulls from NOAA weather sites, while rainfall and tide data are sourced from the NOAA National Centers for Environmental Information (NCEI) database.

Documentation and Data Management

Data is recorded on data sheets and manually entered into a master spreadsheet on Google Drive by technicians. All data entries are audited and analyzed by the Science & Research Manager for quality assurance and accuracy. Scans of data sheets and images from quality control protocols are stored in Google Drive. Exceedance results are reviewed by the Science Engagement Coordinator before publication on Swim Guide.

RESULTS

Swim Guide Metrics

In this pilot project period, there were a total of 419 visits to the four sites that we sampled (Table 1). The website was the preferred platform. Beach at Oleta River State Park was the most popular site.

Swim Guide Traffic Analytics	May - July 2024		
	Mobile Visits	Internet Visits	Total Visits
Beach at Oleta River State Park	1	206	207
Keystone Point Marina	1	32	33
Sandspur Island	0	72	72
Oleta River & NE 163rd St	3	104	107
		TOTAL	419

Table 1. Total mobile and internet visits on the Swim Guide application

Water Quality Results

Since the initiation of this pilot program, Ballyhoo Media has collected 36 water samples, including 20 site samples, 5 opportunistic samples, 5 replicate samples and 6 field blanks. Samples were processed and analyzed by Miami Waterkeeper.

Enterococci

All averages are reported as (Mean ± Standard Deviation).

During this pilot study, 20% of the samples collected were in exceedance of the DOH threshold for enterococci (> 70 MPN) (Table 2 & 3). The highest number of exceedances and the highest average enterococci concentrations were found at Keystone Point Marina. This site is located within a canals so the water flow is restricted compared to the other sites, likely resulting in the higher abundance of fecal indicator bacteria.

Water Quality Data May - July 2024	Enterococci				
	Sample size (n)	Number of Exceedances	Percent of Failure	MPN	± SD
Keystone Point Marina	4	2	50%	163	± 257
Beach at Oleta River State Park	5	0	0%	6	± 2
Oleta River & NE 163rd St	6	1	17%	28	± 45
Sandspur Island	5	1	20%	52	± 97
Overall	20	4	20%	62	± 111

Table 2. Site specific average enterococci concentrations and number of times results exceeded recreational water quality criteria.

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Opportunistic Samples

At the opportunistic sampling sites, there was elevated fecal indicator bacteria levels at the Hollywood Firehouse location, which was sampled during an outfall discharge event. Ballyhoo staff identified this location for sampling due to the frequent high volume discharge occurrences at the exposed outfall near the firehouse. The enterococci levels were elevated in the discharge.

Water Quality Data <i>Opportunsitic Samples</i>	Enterococci				
	Sample size (n)	Number of Exceedances	Percent of Failure	MPN ± SD	
Dumbfounding Bay	2	0	0%	34 ± 41	
Hollywood Firehouse	1	1	100%	71	
Hollywood Pump Station	1	0	0%	20	
Sandspur Island West	1	0	0%	10	

Table 3. Site specific average enterococci concentrations and number of times results exceeded recreational water quality criteria for the opportunistically sampled sites.

Environmental data

Environmental data, collected with a YSI EXO1 datasonde, indicates lower dissolved oxygen and higher chlorophyll at the two canal associated sites, Keystone Point Marina and Oleta River & NE 132rd St. Salinity and temperature was not significantly different between sites.

Water Quality Data <i>May - July 2024</i>	Environmental Data								
	Sample size (n)	Water Temperature		Salinity		Turbidity		Dissolved Oxygen	
		°C ± SD	ppt ± SD	ppt ± SD	ppt ± SD	% ± SD	mg/L ± SD	ug/L ± SD	
Keystone Point Marina	4	29.2 ± 3.0	32.6 ± 4.0	1.8 ± 1.4	86.9 ± 14.9	5.7 ± 1.2	4.8 ± 2.9		
Beach at Oleta River State Park	5	31.4 ± 2.8	33.6 ± 3.1	-0.1 ± 0.1	101.9 ± 9.0	6.4 ± 0.6	0.7 ± 0.3		
Oleta River & NE 163rd St	6	30.7 ± 3.7	30.5 ± 5.3	0.6 ± 0.3	83.9 ± 6.7	5.4 ± 0.5	2.0 ± 0.6		
Sandspur Island	5	31.6 ± 2.8	32.7 ± 3.2	0.0 ± 0.1	106.5 ± 14.0	6.7 ± 0.9	0.8 ± 0.2		
Overall	20	30.7 ± 2.9	32.2 ± 3.8	0.6 ± 0.9	94.0 ± 14.0	6.0 ± 0.9	2.1 ± 2.1		

Table 4. Average water temperature, salinity, turbidity dissolved oxygen, and chlorophyll a for samples collected by Ballyhoo from April-July 2024. Data from 5/29/2024 and 6/11/2024 is missing due to equipment malfunction.

Environmental data collected simultaneously with fecal indicator bacteria can provide additional context for water quality assessments. While this data does not identify the source of the bacteria, it can indicate generally poorer water quality when dissolved oxygen levels are low and chlorophyll levels are high. Temperature and salinity further inform us about water conditions that can influence bacteria levels. Warmer temperatures can accelerate bloom development and growth, while lower salinity levels may occur due to increased freshwater flow from stormwater or canal influence. Stormwater and canal-associated waters often contain higher nutrient levels due to increased runoff from land-based pollutants.

CONCLUSIONS

Although this three-month pilot study represents a relatively brief period for a monitoring program, it has successfully provided the local community with critical water quality data, enabling visitors to make informed decisions before interacting with the water. Establishing a robust monitoring program is essential, as it can quickly alert us to water quality issues, helping to protect public health by establishing a baseline for each unique location.

While the limited sample size in this study precluded robust temporal or spatial comparisons between sites, the preliminary data collected provides valuable insights. Notably, the canal-associated sites—Keystone Point Marina and Oleta River & NE 163rd St—showed slightly higher levels of fecal indicator bacteria. These sites also had lower dissolved oxygen levels and higher chlorophyll concentrations. This aligns with the understanding that canal-associated sites often experience higher nutrient loading and retention due to restricted flow and proximity to impervious surfaces, which contribute to the runoff of land-based pollutants. Elevated nutrient levels can promote the growth of enterococci and algal blooms by providing ideal conditions for their development. When algal blooms are present, the increased organic content in the water column can indirectly lower dissolved oxygen levels as detritivore bacteria decompose the organic material, consuming oxygen in the process. In contrast, sites within the more open portions of Biscayne Bay, such as Sandspur Island and the Beach at Oleta River State Park, exhibited higher flushing rates due to their proximity to the Haulover Inlet and greater distance from seawalls and impervious surfaces.

Throughout the three-month study, water quality was generally sufficient for recreational use at Oleta River & NE 163rd St, Sandspur Island, and the Beach at Oleta River State Park. However, ongoing monitoring is crucial to continue providing the public with up-to-date information about fecal indicator bacteria concentrations at these sites. Increasing awareness about these sites on the Swim Guide app can ensure that community visitors are properly informed about bacteria-related health risks associated with recreational activities.

This preliminary monitoring, supported by Ballyhoo Media, has laid the groundwork for future research and monitoring efforts. Ballyhoo Media's role has been instrumental in this endeavor, not only through their logistical support but also by championing environmental stewardship through their Blue Beacon program. Their commitment to ocean conservation and community engagement has been vital to the success of this pilot study, demonstrating how partnerships between environmental organizations and innovative businesses can have a positive impact on public health and environmental protection.

Looking ahead, expanding this monitoring program will be essential for developing a more comprehensive understanding of water quality trends in Northern Biscayne Bay. The continuation of this work will allow for more detailed temporal and spatial analyses, providing a clearer picture of the environmental dynamics at play. This data will be invaluable for informing local water management strategies, protecting public health, and preserving the natural beauty and ecological integrity of Biscayne Bay for future generations.



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