Marcos Pena
GreenPlanet Waterways
Eco America
Biscayne Bay Advocates

National Environmental Monitoring Conference

Date: August 5, 2022

Growing Climate Solutions
Path to Positive
Southwest Florida

FROM THE DASHBOARD TO THE BAY

Growing Climate Solutions
Path to Positive
Southwest Florida

Growing Climate Solutions: Path to Positive Southwest Florida

Recognizes

Marcos S Pena

As a

Southwest Florida Climate Ambassador

4/20/2021

mpletion of the Path to Positive Communities Ambassadors Training Program. This tr
ides ambassadors with current information on climate impacts, solutions, and advo
s on climate action in Florida and the United States with the expectation that amb
will speak and advocate on climate solutions.

PathtoPositive.org

White House Communications Agency

Certificate of Appreciation

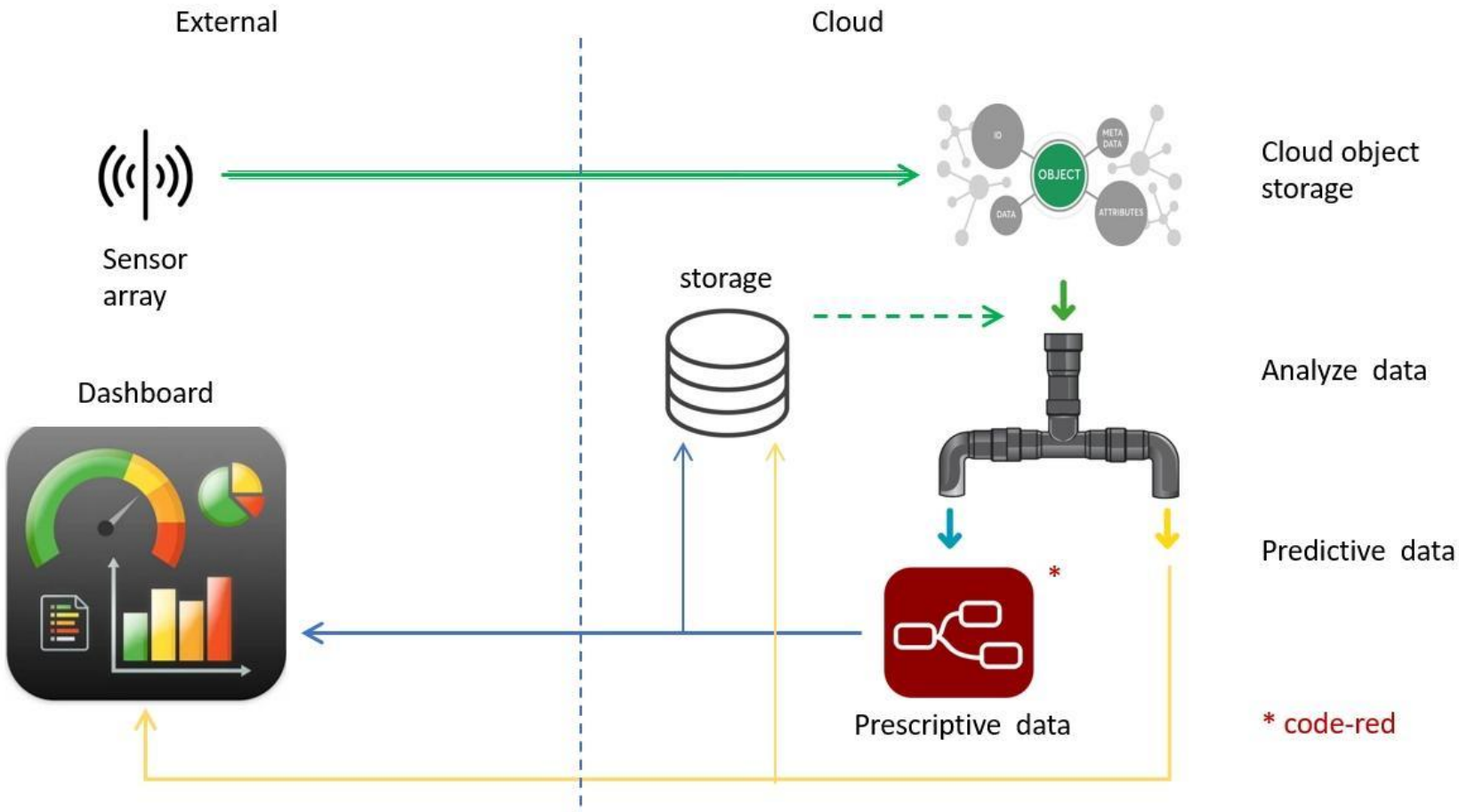
Presented To

MARCOS PENA

The members of the White House Communications Agency wish to express our sincere appreciation for the outstanding manner in which you provided support to the President of the United States during his visit to Annapolis, Maryland. Your unique abilities, coupled with your superb attitude and professionalism, enabled our Agency to provide critical communications for the President, the White House Staff and the United States Secret Service.

27 November 2007
Date

BRIAN VILLA
Presidential Communications


External
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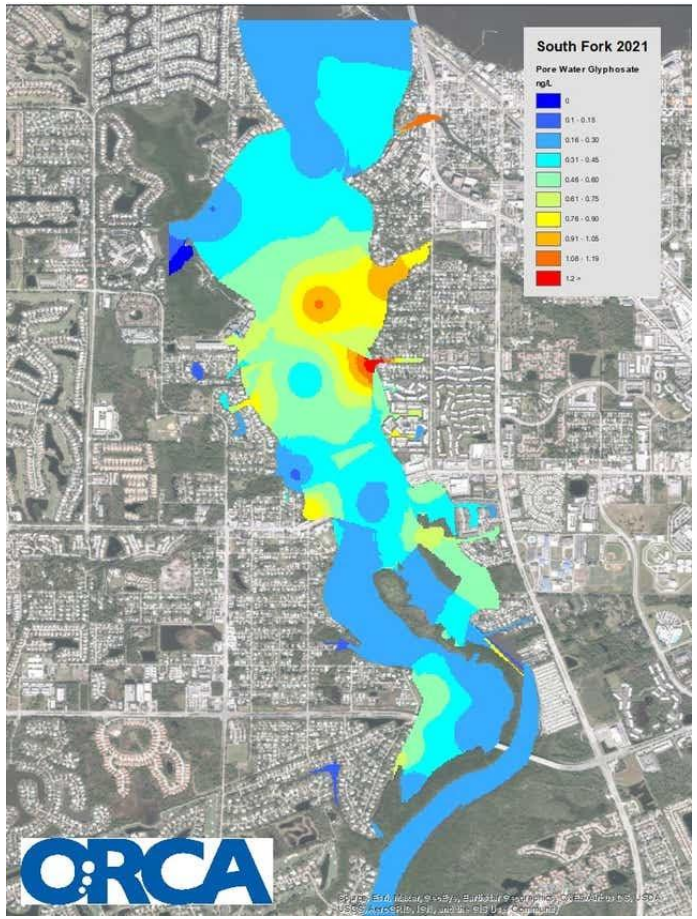
BISCAYNE BAY



MASS FISH KILLS

SOCIAL MEDIA

INCIDENT REPORTS

Ken Russell - City of Miami Commissioner

We need to enhance penalties for construction permit holders caught violating code by dumping wastewater from construction sites into streets. We are absolutely getting flooded with reports of pollution and many of these incidents are coming from construction sites so we are getting lots of reports of sediment plumes getting out into the water, we are getting reports of illegal dumping.

Josie Diaz - Lifelong Manatee Lover

That is so terrible! What can we do to help?

Josie Diaz - Lifelong Manatee Lover

That is so terrible! What can we do to help?

REPORTING MAP

REPORT AN INCIDENT

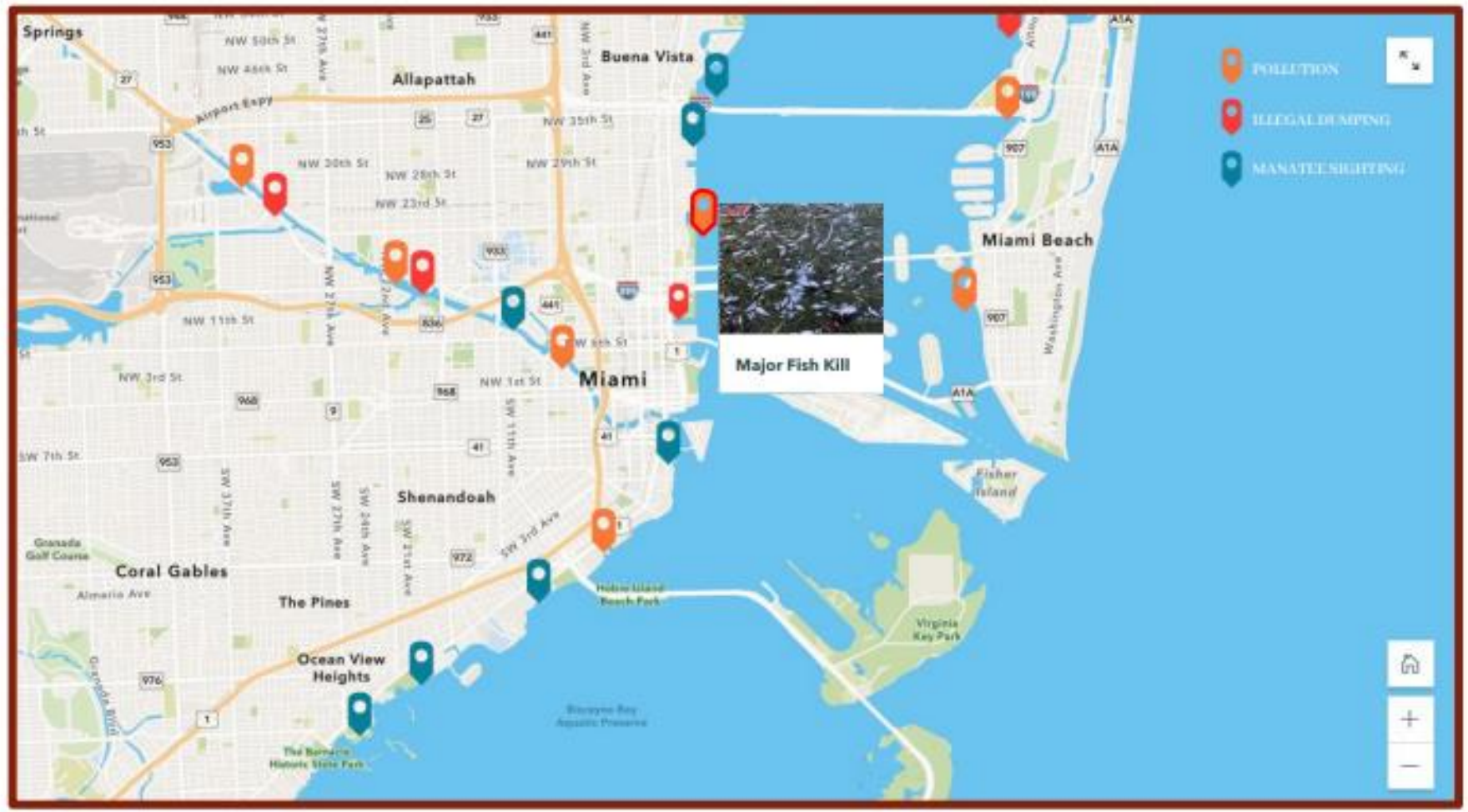
+

Add Image

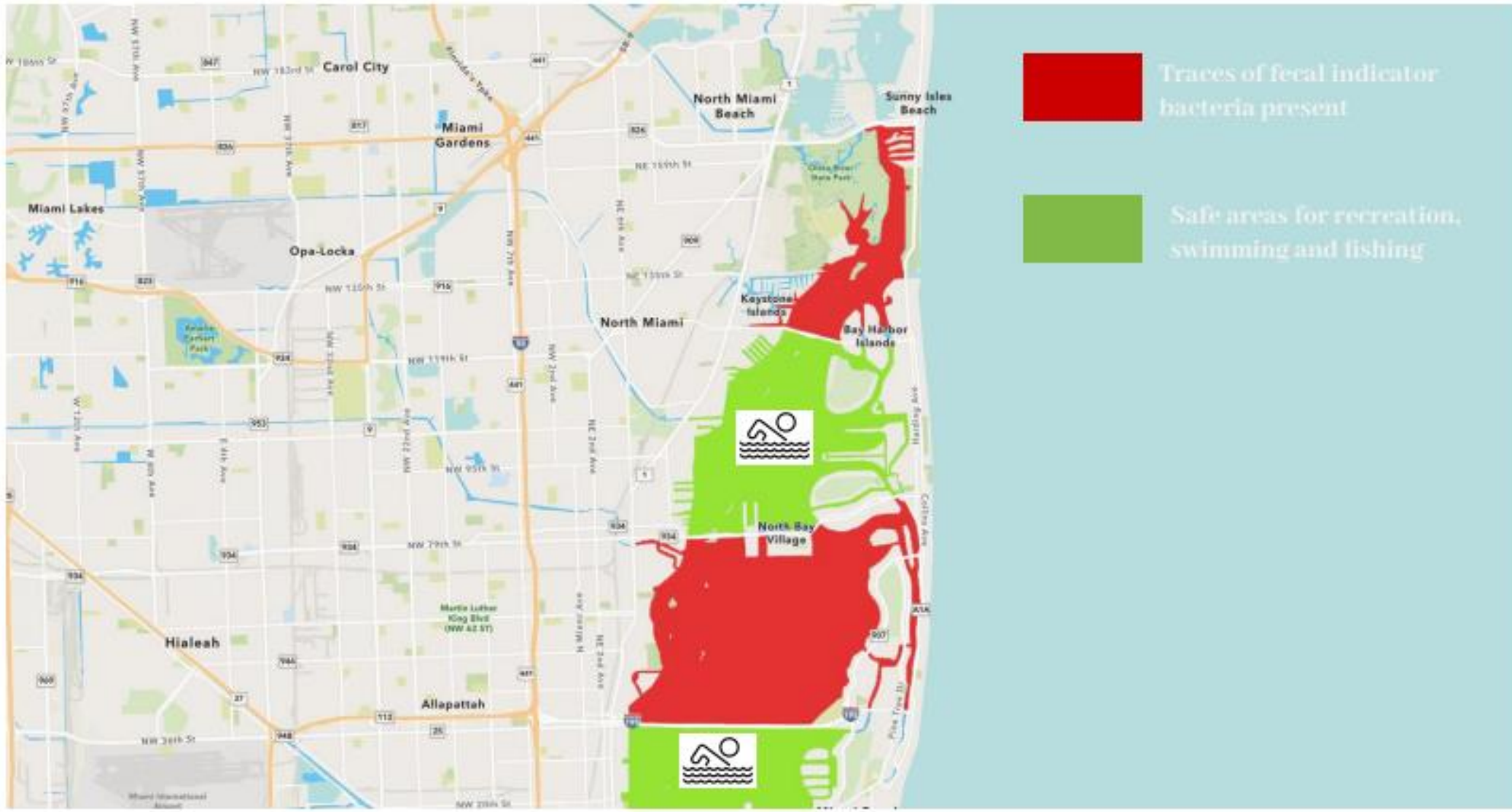
Category:

Title:

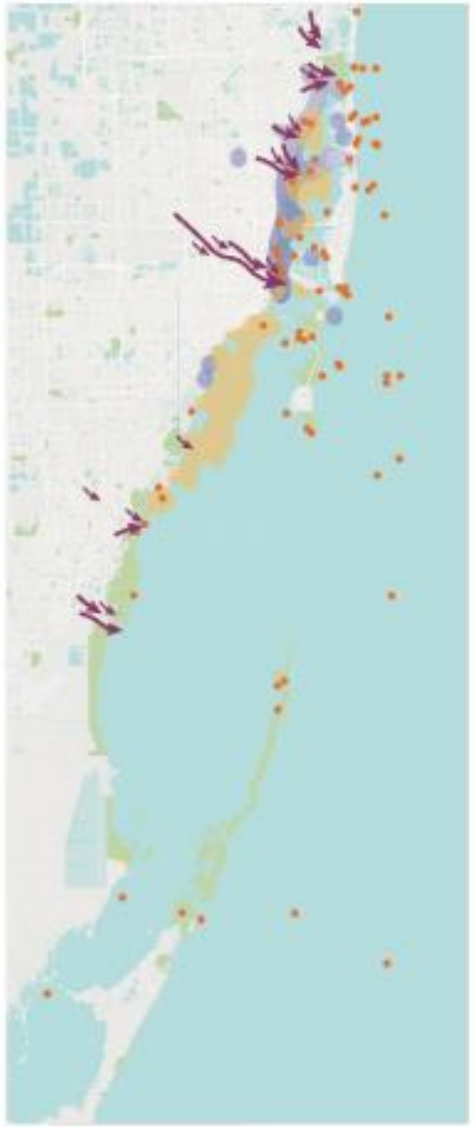
Description:



WATER QUALITY



WATER POLLUTION IN THE BAY



Water Pollution Map

Recent studies and reports have concluded that the health of Biscayne Bay is at a tipping point. The ecosystem is threatened by nutrient pollution from stormwater runoff, sewage pipe breaks, septic tanks, fertilizers, plastic pollution and other contaminants.

Water Pollution Map

Between August 10-15, 2020, the Miami community reported thousands of dead and dying marine life or animals struggling for air across northern Biscayne Bay. Data indicate that low DO levels led to the fish kill.

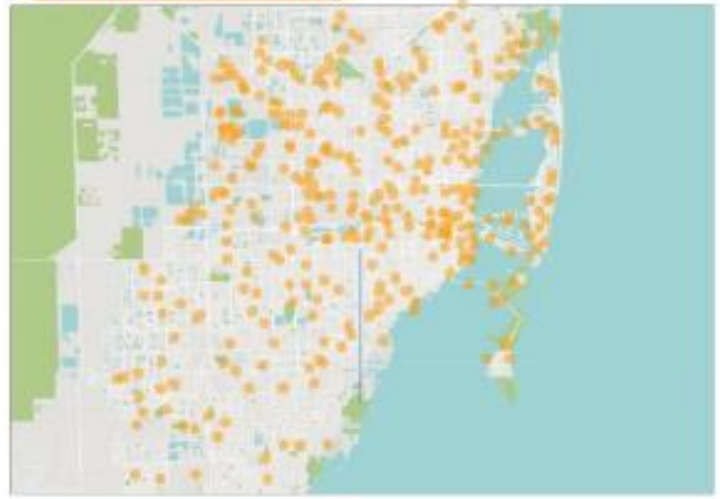
Water Pollution Map

A macro-algal bloom that initiated in 2008 that continues today, although diminished. The impacted area runs along the western shore south of Rickenbacker Causeway to south of Coral Gables and out to mid-bay.

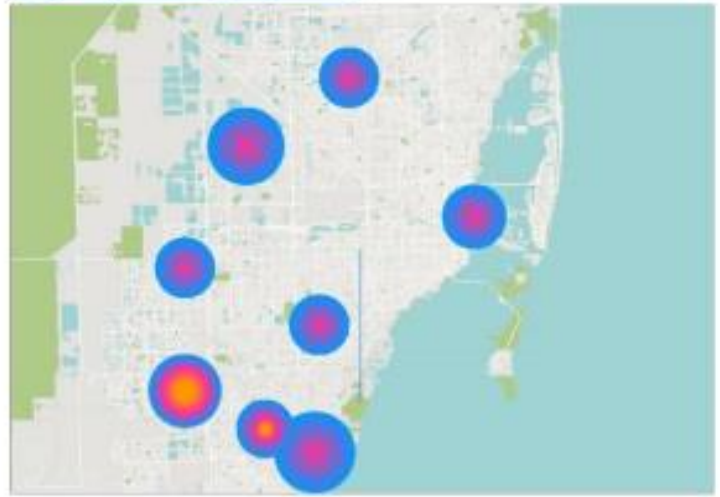
Water Pollution Map

Scientists estimate that seagrasses have decreased by up to 90% in some areas of Biscayne Bay and have disappeared entirely from others.

Water Pollution Map

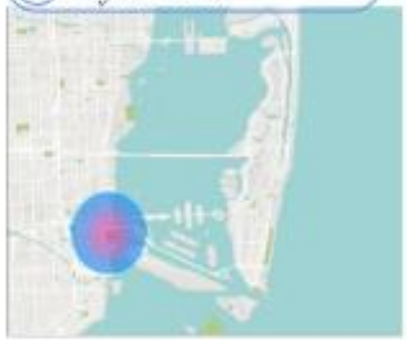


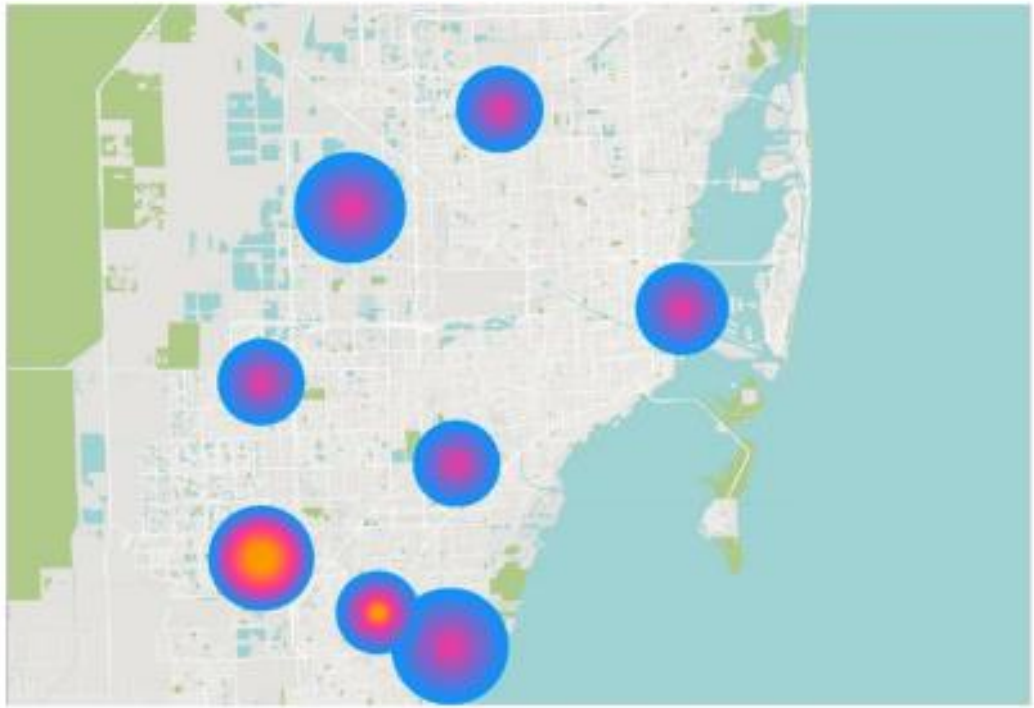
Illegal Dumping



ILLEGAL DUMPING NEAR YOU

In your area





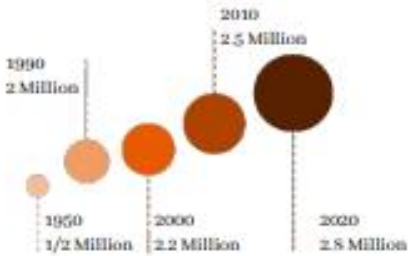
Dumping Sources

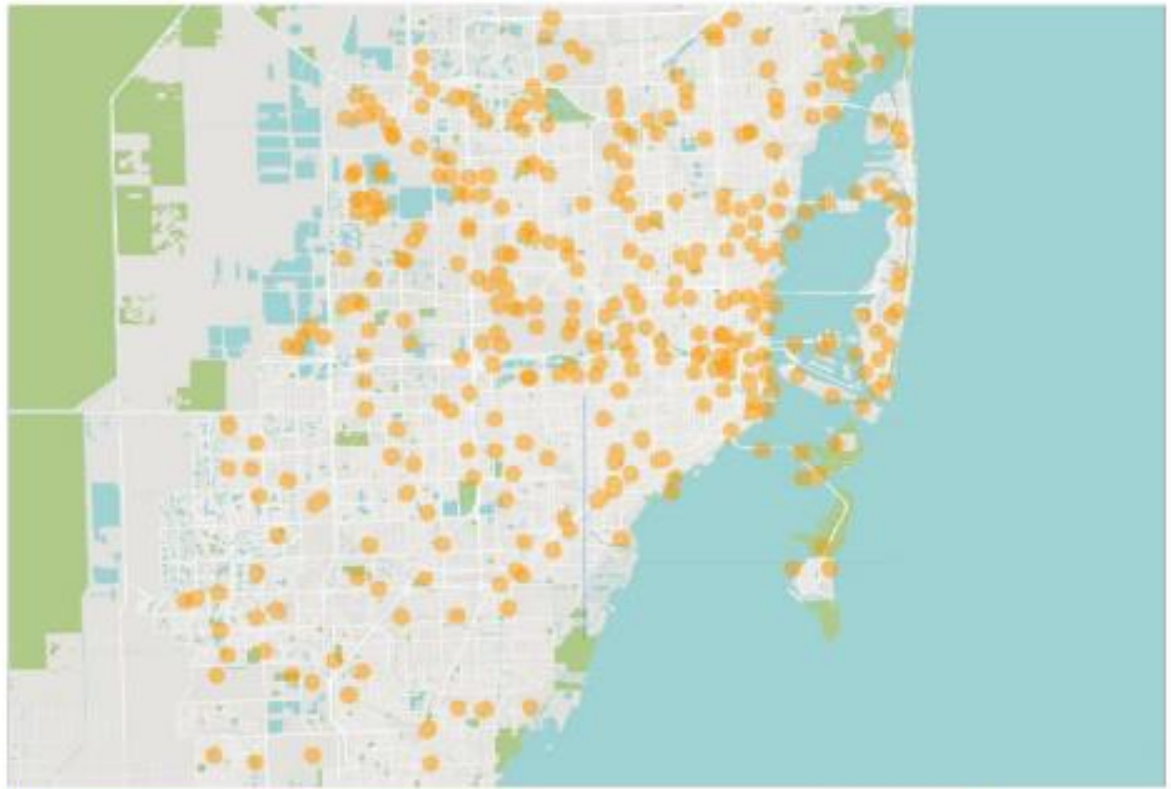
Sediment is a contributing factor say water quality experts in the on-going fight to save Biscayne Bay. Since this summer's historic fish kill, a new resolution passed by the Miami City Commission on Thursday directs the city manager to investigate options to enhance penalties for construction permit holders caught violating code by dumping wastewater from construction sites into streets.

Go to the Articles

WATER POLLUTION NEAR YOU

500-5,000 ppl/sqft
5,001-10,000 ppl/sqft
10,001-30,000 ppl/sqft
30,001-112,000 ppl/sqft





Water Pollution

The problem of water pollution is a weak part of the WWDR. Pollution is becoming worse, especially in the last few decades, but seems to be inadequately reported. Pollution of water is correlated with population density and economic growth. Non-point source pollution from agriculture and urban areas and industry point source pollution contribute to the pollutant load.

Enter a city, airport or zip code.

Search

Water Quality: 33160

-pH: 8.5

-Temperature: 27.2 C

-Turbidity: 50%

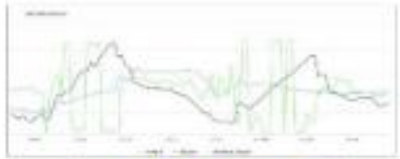
- Dissolved oxygen: 8 mg/L

-Chlorophyll: 5.55 g/mL

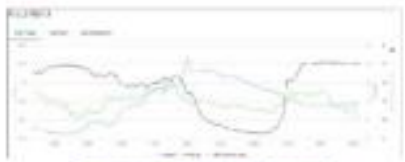
-Conductivity (for salinity): 3.63 psu

FIU RESEARCH BUOYS

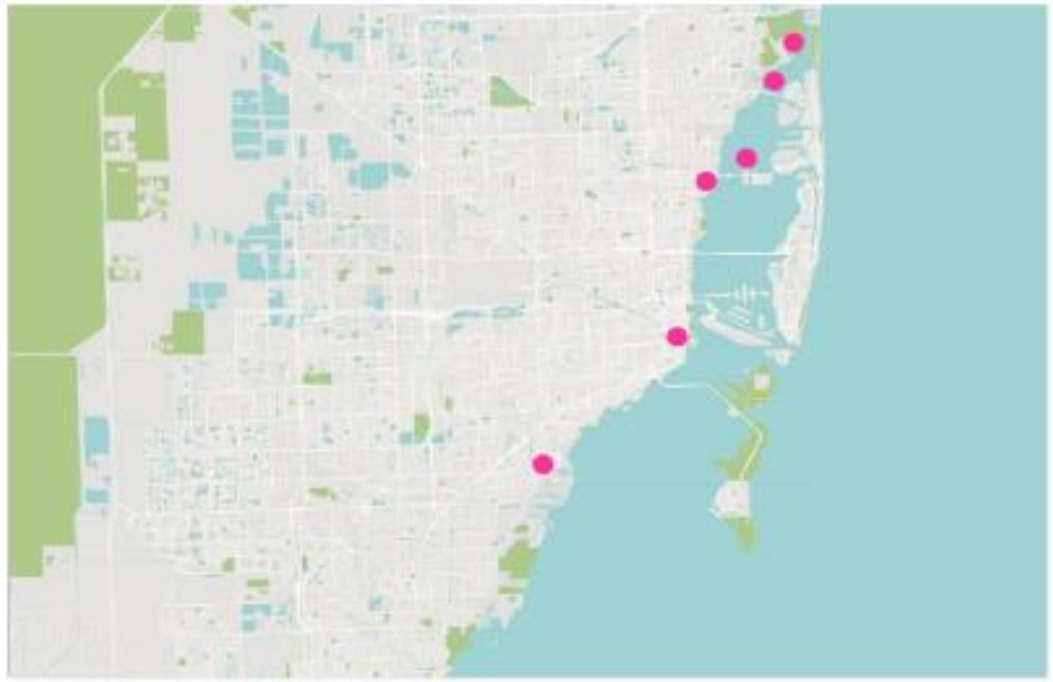
Coral Gables Canal



Little River



More Buoy Info



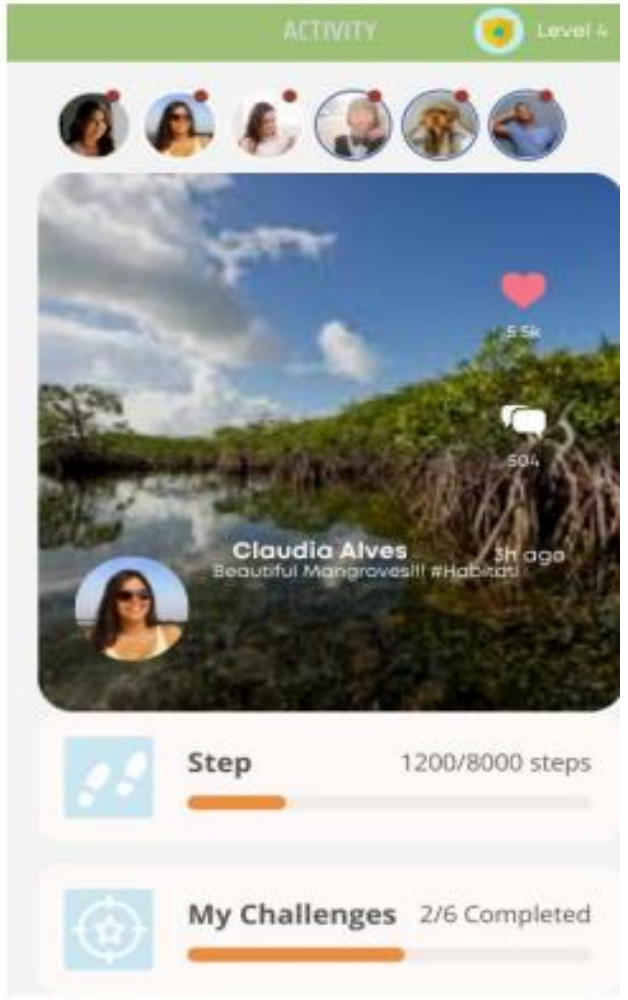
Water Pollutants

Sediment is a contributing factor say water quality experts in the on-going fight to save Biscayne Bay. Since this summer's historic fish kill, a new resolution passed by the Miami City Commission on Thursday directs the city manager to investigate options to enhance penalties for construction permit holders caught violating code by dumping wastewater from construction sites into streets.

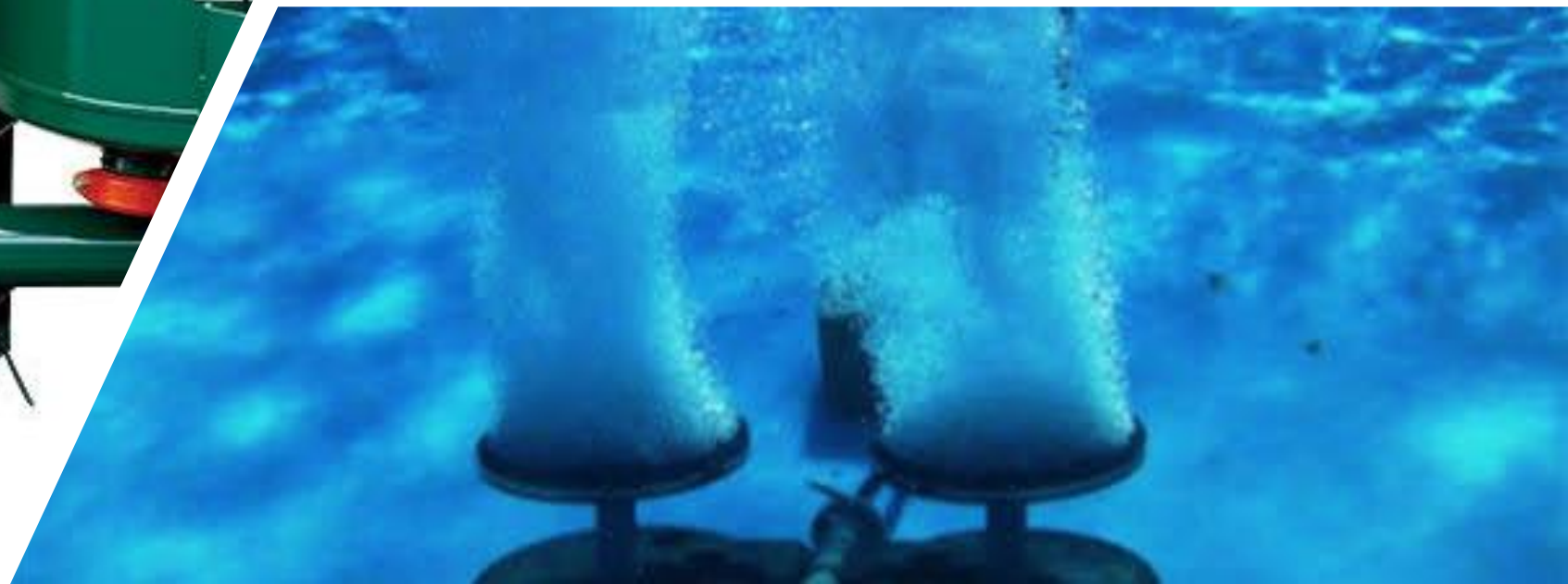
Go to the Articles

Community Dashboar

Share and Connect




EVERFILT.



LITTLE RIVER IN MIAMI

In an FIU study oysters in Biscayne Bay have the highest concentration of forever chemicals than any in the state of Florida while being the smallest

North Biscayne Bay an Analysis

Terry McDevitt

10/10/2021

Background

It begins with Napoleon Bonaparte Broward, and the Florida governor's campaign to transform the Everglades into farm land. Sugar cane became the major industry of the early 20th century, and it was drainage canals that made it possible. But in those days, the canals were navigable through locks allowing boats to travel the full length of the canal as well as maintain canal water levels. Although man-made, water flow was mostly unencumbered and flowed freely more like a natural river.

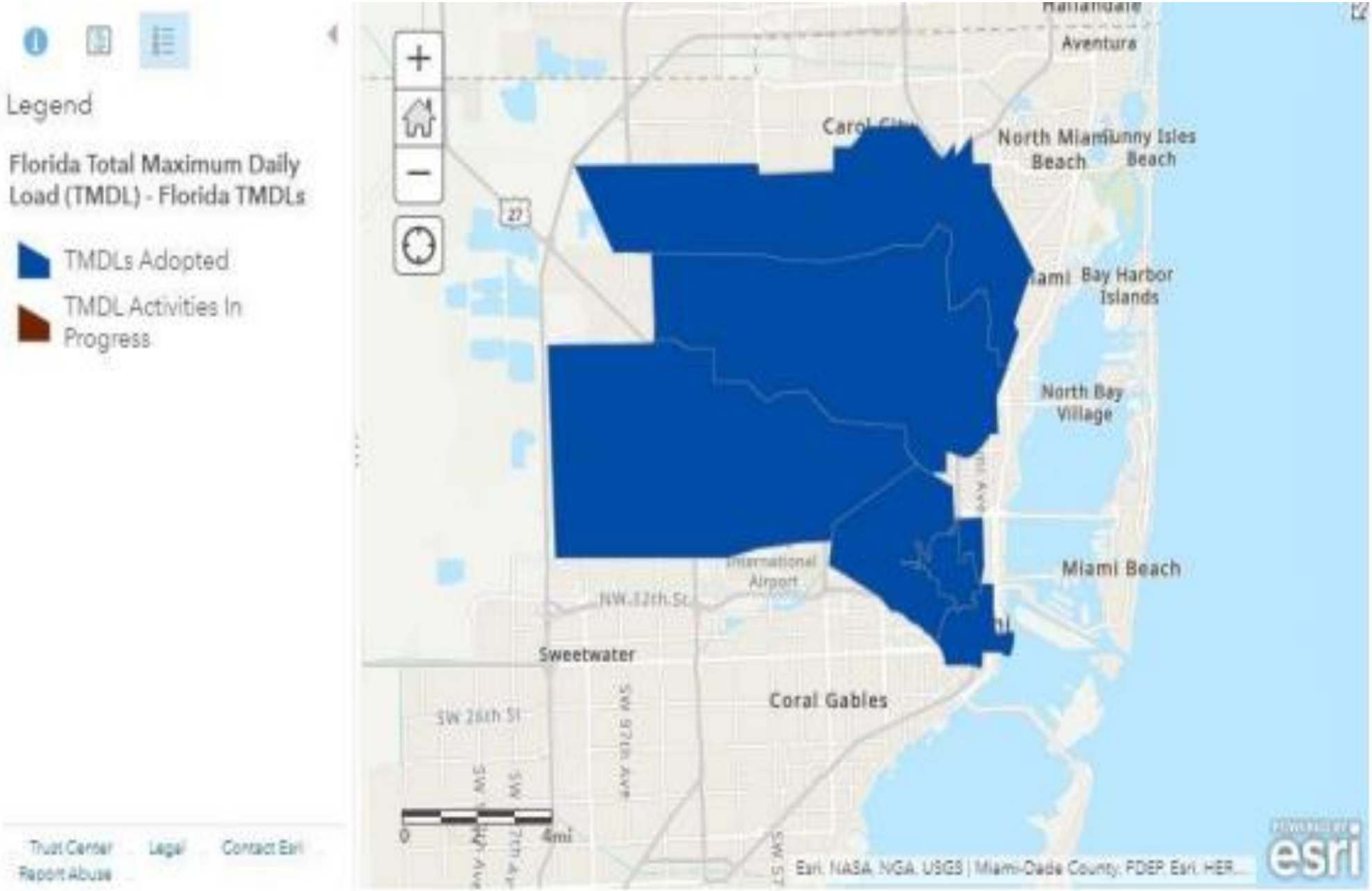
Over the years, man has imposed his will over the landscape of South Florida, replacing locks with water control structures in order to manage the flow of canal water partially based on a claim to reduce flooding. Canals that were once fully navigable are now reduced in that capacity, resulting in a network of canals where the "hydrology within [Miami-Dade] county is highly manipulated by a series of water control structures, pumps and levees that have altered the natural hydroperiods and flows within these watersheds." (U.S.Geological Survey[USGS]1999)

"All canal segments contain either a water control structure within them or are directly influenced by the operation of an upstream or downstream control structure.

Map of Water Control Stuctures

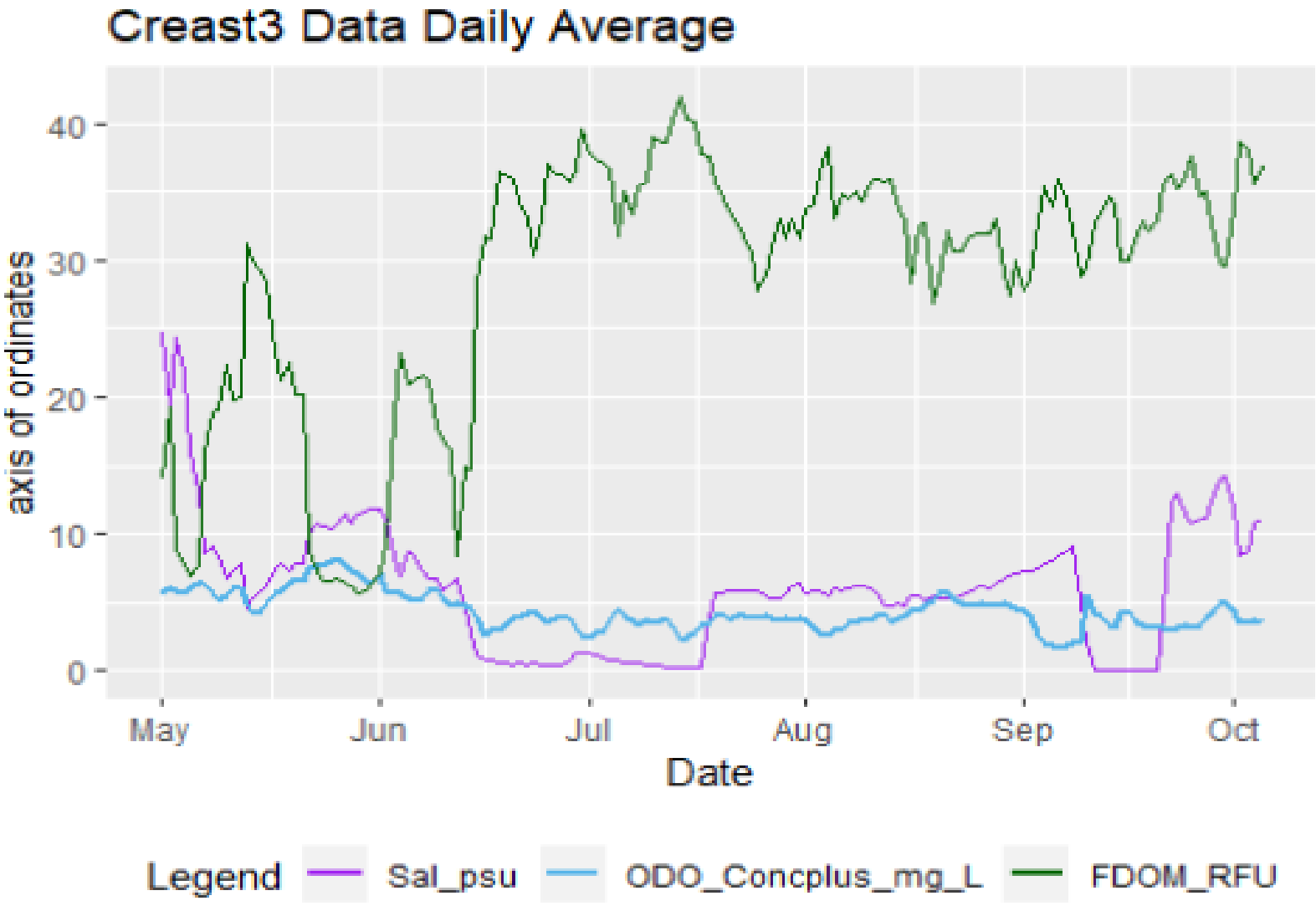
The C-7 (Little River) Canal (WBID 3287) is located in northeastern Miami–Dade County. The canal was designed with two purposes: providing flood protection and drainage for the C-7 watershed, and maintaining an adequate ground water table elevation to prevent saltwater intrusion into local ground water (Cooper and Lane 1987). During periods of low natural flow, the C-6 Canal supplies water to the C-7 watershed (Cooper and Lane 1987). The C-7 flows to the east, with a discharge via the S-27 water control structure to Biscayne Bay. The S-27 controls stages in the C-7 and regulates discharges to tidewater. The G-72 water control structure, which is normally closed, acts as a divide between the C-7 and the C-6. When water in the C-7 is below the optimum level, G-72 can be opened to supply water from the C-6 to the C-7 watershed (Cooper and Lane 1987)" (Florida Department of Environmental Protection)

The report just quoted indicated that the Biscayne, little River, Miami River over all segments tested are contaminated, and do not meet Florida's Total Maximum Daily Load (TMDL). The largest exceedances of TMDL occurred in February, July, and October (all above 30%) as data from the report shows. Although this report was written in 2012, as of 10/04/2021 the Miami-Dade county region is classified as TMDLs Adopted, but no TMDLs activities in progress are indicated by the Florida Department of Environmental Protection.


Legend
Florida Total Maximum Daily Load (TMDL) - Florida TMDLs
TMDLs Adopted
TMDL Activities In Progress
Aventura
North Miami Beach
Sunny Isles Beach
Bay Harbor Islands
North Bay Village
Miami Beach
International Airport
NW 12th St
Sweetwater
Coral Gables
SW 24th St
SW 97th Ave
0
4mi
Trust Center
Legal
Contact Esri
Report Abuse
Esri, NASA, NGA, USGS | Miami-Dade County, FDEP, Esri, HER...
esri

Biscayne Bay is comprised of a shallow estuarian lagoon system. The North Bay of Biscayne Bay lies between the mainland of Miami, the barrier islands to the east, Broward County to the north, and Rickenbacker Causeway to the south. The North bay is connected to the Atlantic ocean by a series of channels and cuts, and comprises about 10% of the total Biscayne Bay area. Cuts and islands in the North Bay are man-made, and at least 40% of the North Bay has been dredged.

Florida International University's (FIU) Institute of Environment maintains research buoys in Biscayne Bay. Two of the three buoy sites are in the North Bay area. The CREST3 buoy is located on the little river near the outlet into the Bay north of the Bella Meade island. The CREST2 buoy is in the North Bay proper south of the Biscayne Bay canal, and closer to the Miami side of the Bay then the the North Beach side.


Creast3 Data Daily Average
axis of ordinates
40
30
20
10
0
May
Jun
Jul
Aug
Sep
Oct
Date
Legend
Sal_psu
ODO_Concplus_mg_L
FDOM_RFU

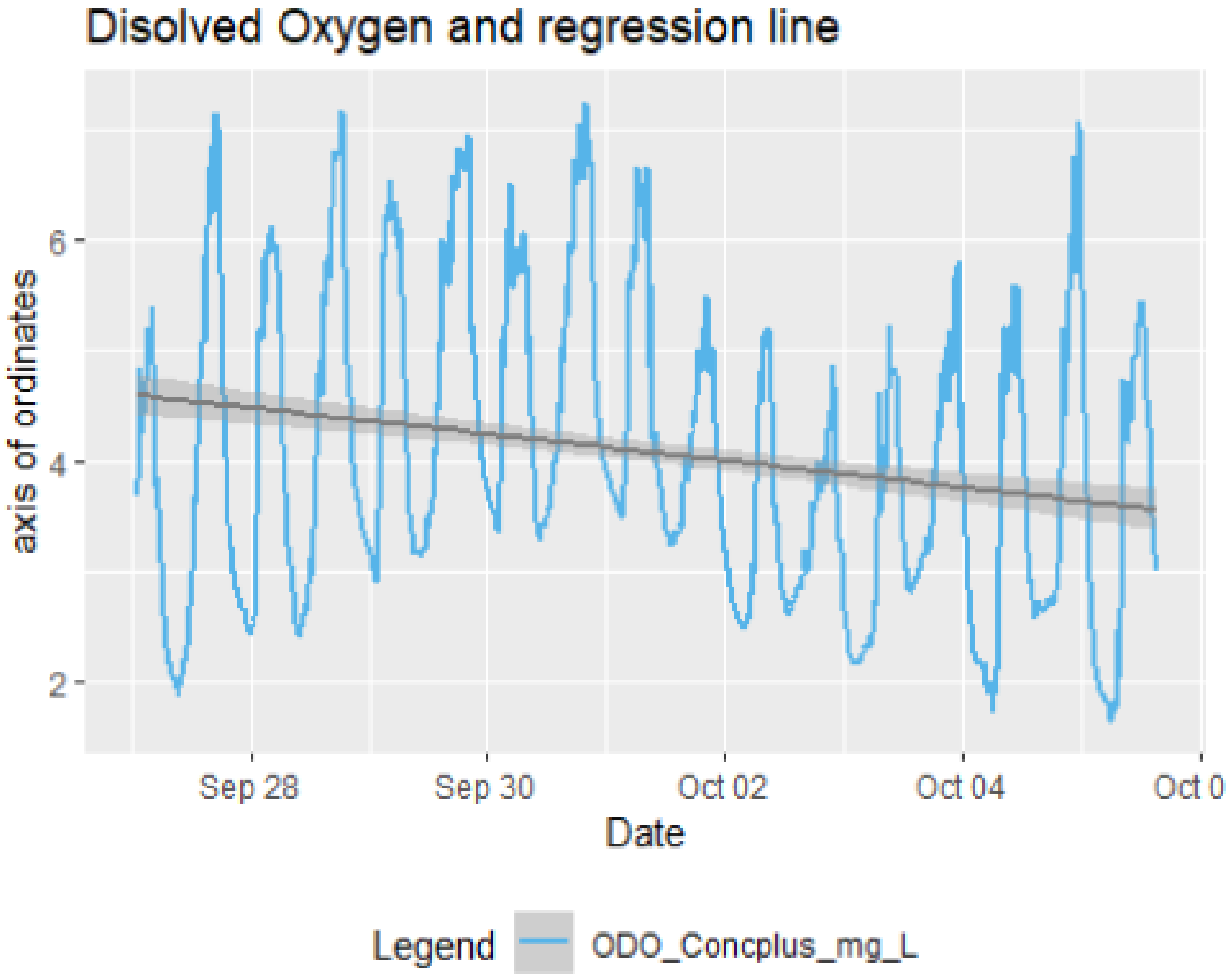
Data Review

In looking at the data from the CREST3 buoy between May and October of 2021 there is a definite "U" shape to the Salinity (Sal_psu) line.Over this time period the dissolved oxygen (ODO_Concplus_mg_L) levels dropped from an average of ~ 7.5 mg/L to and average of ~ 5 mg/L with minimums dropping below 3 mg/L. Also a corresponding jump in dissolved organic matter (FDOM_RFU) can be seen in the plot. The drop in Salinity in September to zero is believed to be a sensor error as the Temp_C value also dropped to zero at the same time.

It is believed that these changes in salinity, dissolved oxygen and dissolved organic matter is due to a release of water from the little river canal. Nutrient rich freshwater causing the salinity to decrease and organic matter to rise at the CREST3 buoy location is consistent with what is known about the water quality of the C-7 canal system, and the desire to prevent saltwater intrusion into the ground water.

Note: Although the data from the Buoys are collected in 15 min increments, It was easier to understand trends when the data was aggregated to daily values, and this is what was used in this plot.

Over these same days dissolved oxygen begins to drop from a starting mean ~5 mg/L to a mean below 4 mg/L at the Crest3 buoy,

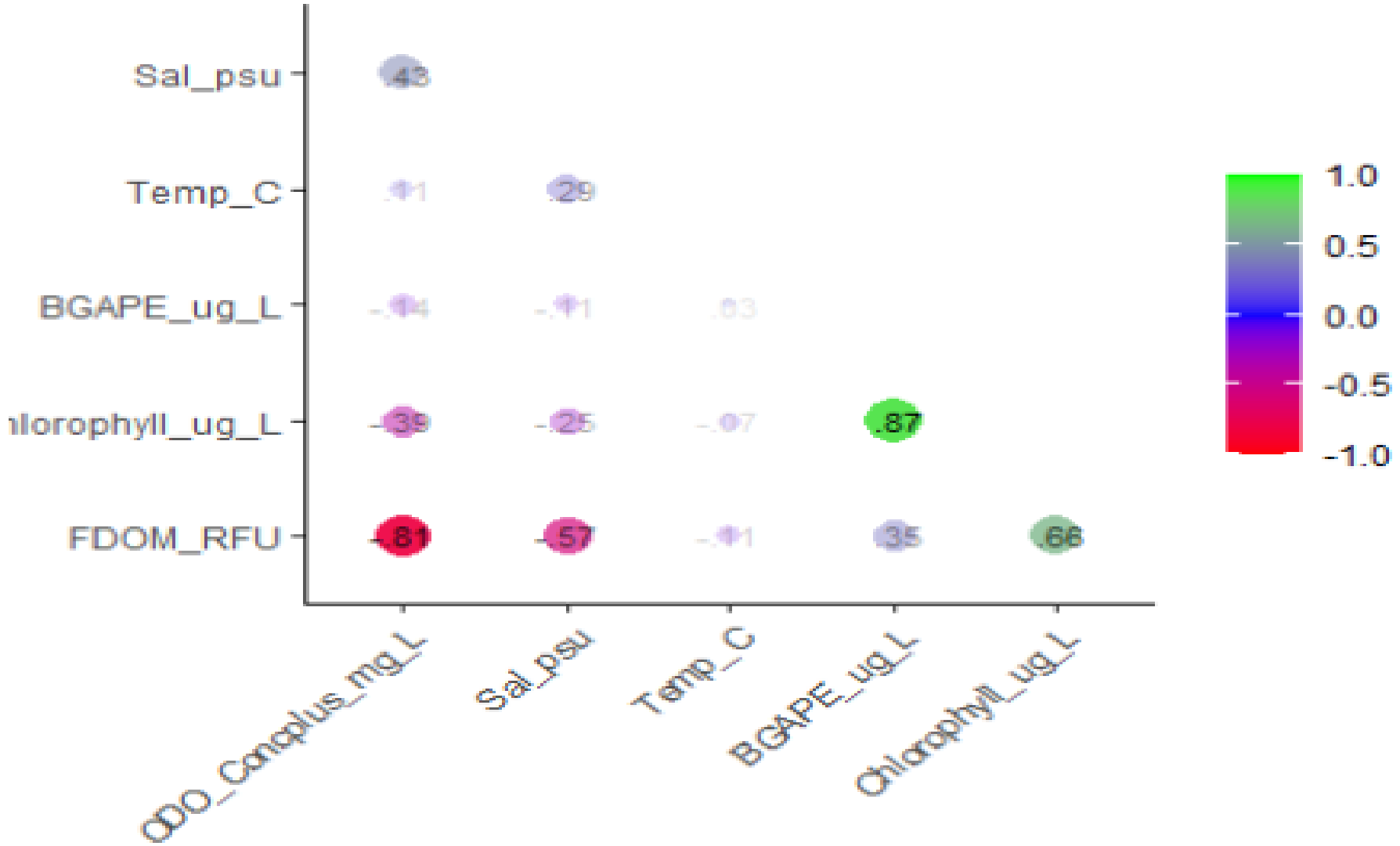


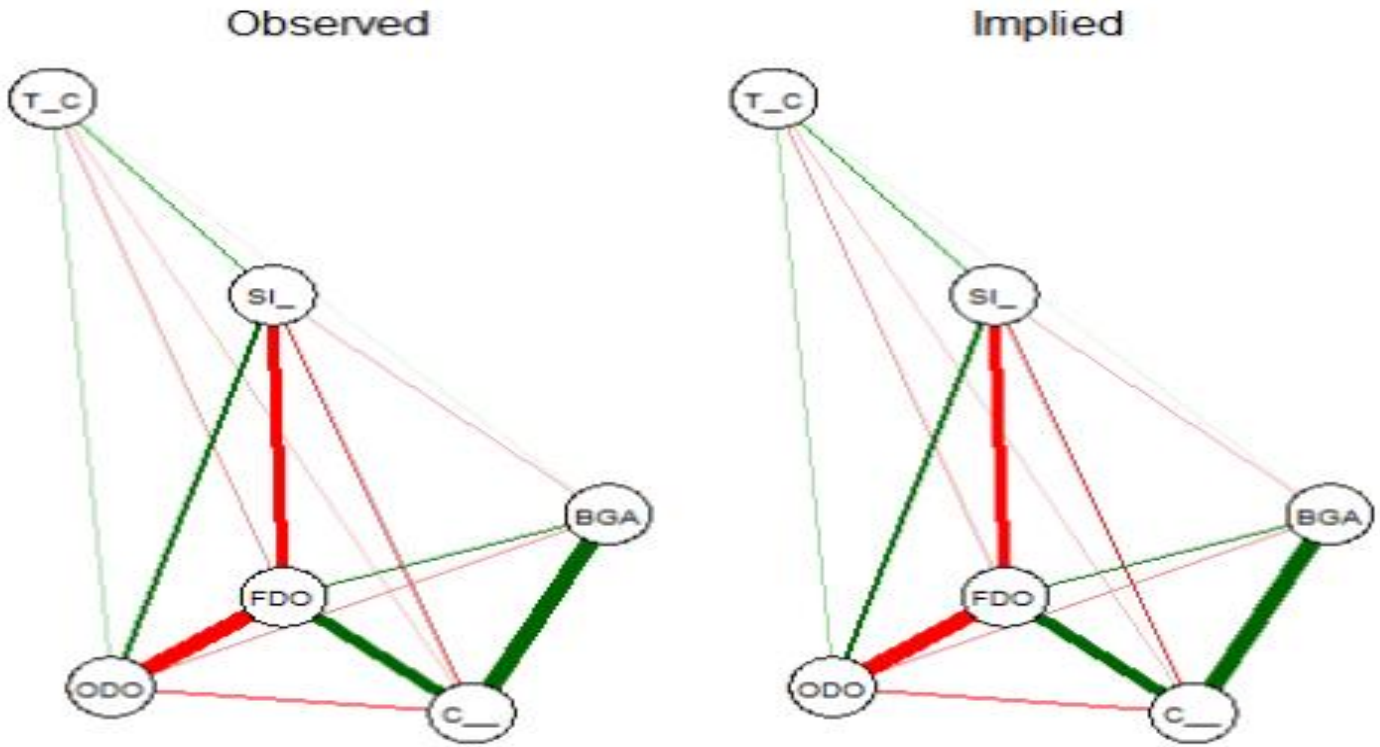
Investigating the correlation between pertinent variables in the Crest3 data, the following two plots are provided: The first plot is a chart from a pearson correlation. The second plot is the correlation from a lavaan linear model where dissolved oxygen (ODO_Concplus_mg_L) was the outcome variable.

Both plots show a strong inverse relationship between dissolved oxygen(ODO in the second plot) and dissolved organic matter (FDOM,FDO in the second graph). An inverse relationship between Salinity (Sal_psu, SL_ in the second plot) and dissolved organic matter. A mild positive relationship between dissolved oxygen and Salinity.

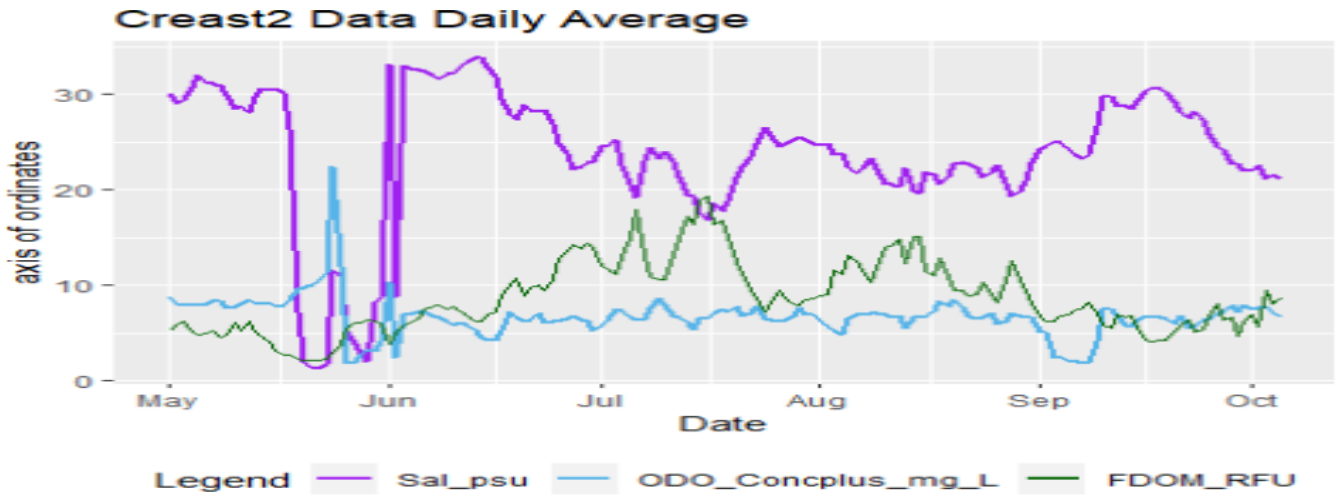
Interesting, there was a weak relationship between these water quality factors and Temperature (T_C in the second graph).

The dissolved organic matter, blue green algae (BGAPE, BGA in the second plot), and Chlorophyll (C__ in the second plot) are all positively correlated, The blue green algae and the Chlorophyll lines are identical with some minor scaling differences. So it is interesting that the correlation between dissolved organic matter and Chlorophyll was stronger than the correlation between dissolved organic matter and blue green algae. Due to the small signal value of both chlorophyll and blue green algae, the differences are considered negligible and therefore the correlation difference to be algorithmic rather than actual.

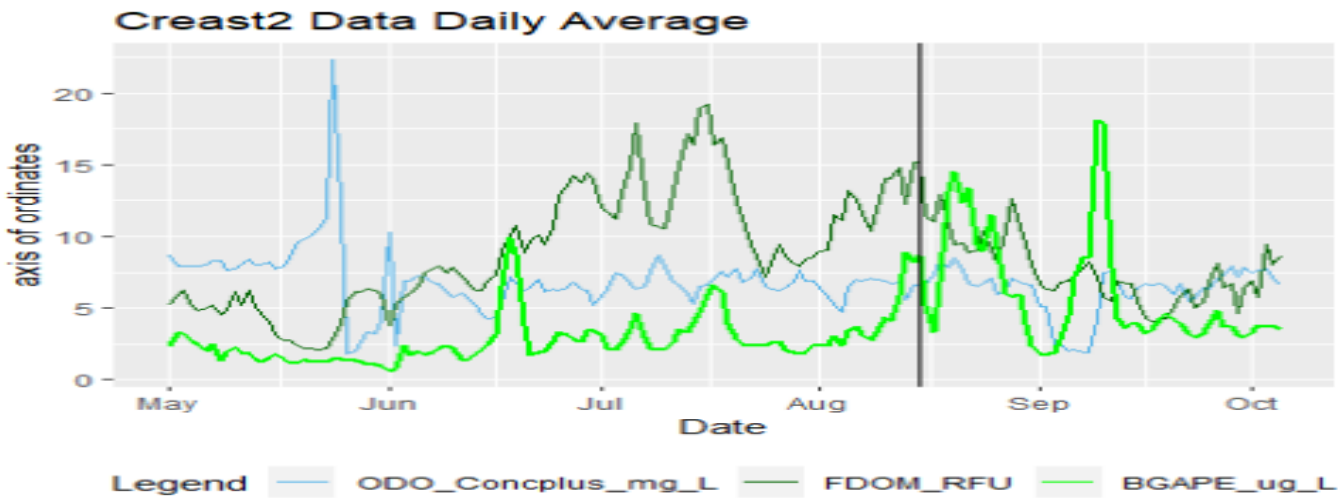

Sal_psu
Temp_C
BGAPE_ug_L
lorophyll_ug_L
FDOM_RFU
.43
.91
.29
-.94
-.91
.83
-.39
-.25
-.07
.87
-.81
-.57
-.91
.35
.66
ODO_Conc.plus_mg_L
Sal_psu
Temp_C
BGAPE_ug_L
Chlorophyll_ug_L
1.0
0.5
0.0
-0.5
-1.0



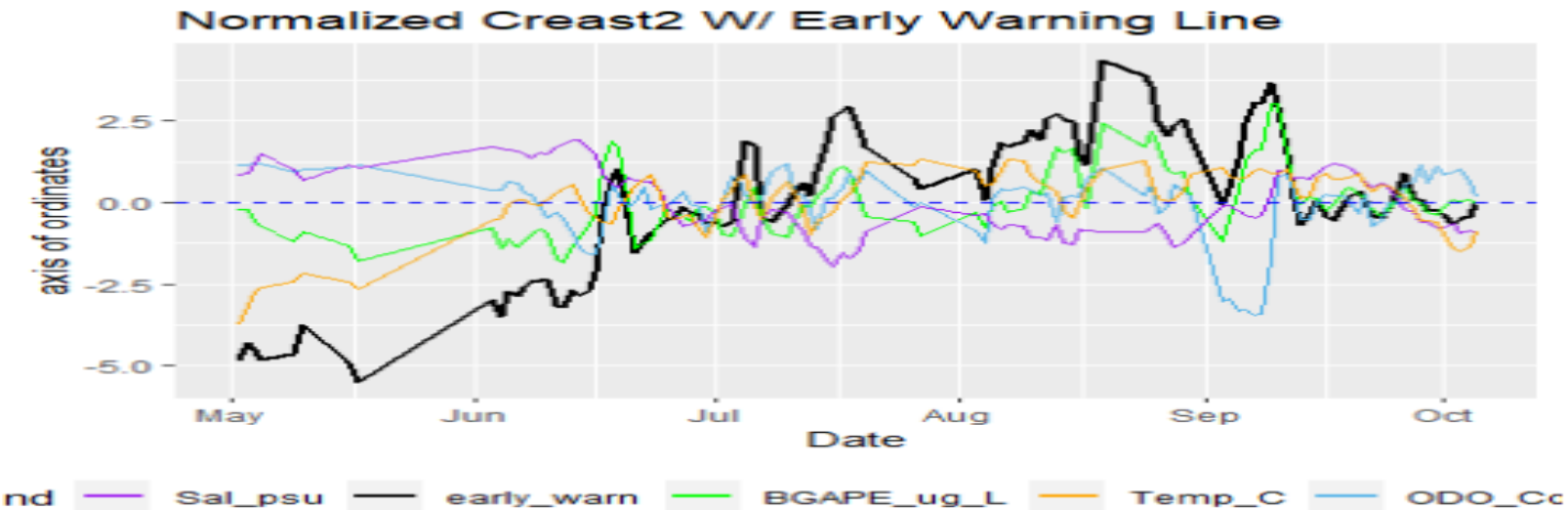
At the Crest2 buoy, The salinity (Sal_psu) concentration is higher, the dissolved organic matter (FDOM_RFU) is lower and the dissolved oxygen (ODO_Concplus_mg_L) is slightly higher. In late May, there was a significant drop in Salinity but a corresponding spike in dissolved oxygen, and Bay temperature (not shown) is indicative of sensor issues, so it is unclear what exactly happened. What is clear is that a low Salinity event happened, and dissolved organic matter began to rise after that event.



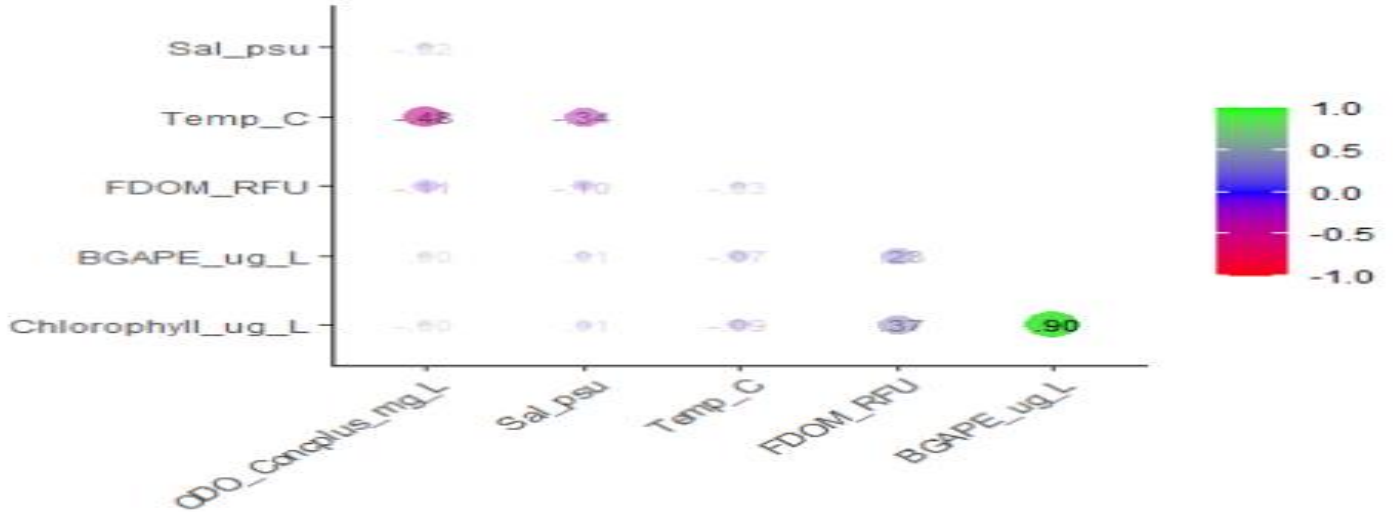
At the beginning of August, data from the from the Crest2 buoy indicates there is a relatively high dissolved organic matter signal as well as a rapid increase in Blue green algae. The single vertical line indicates August 15th. Over the month of August, there was a fish kill event in the North Bay.

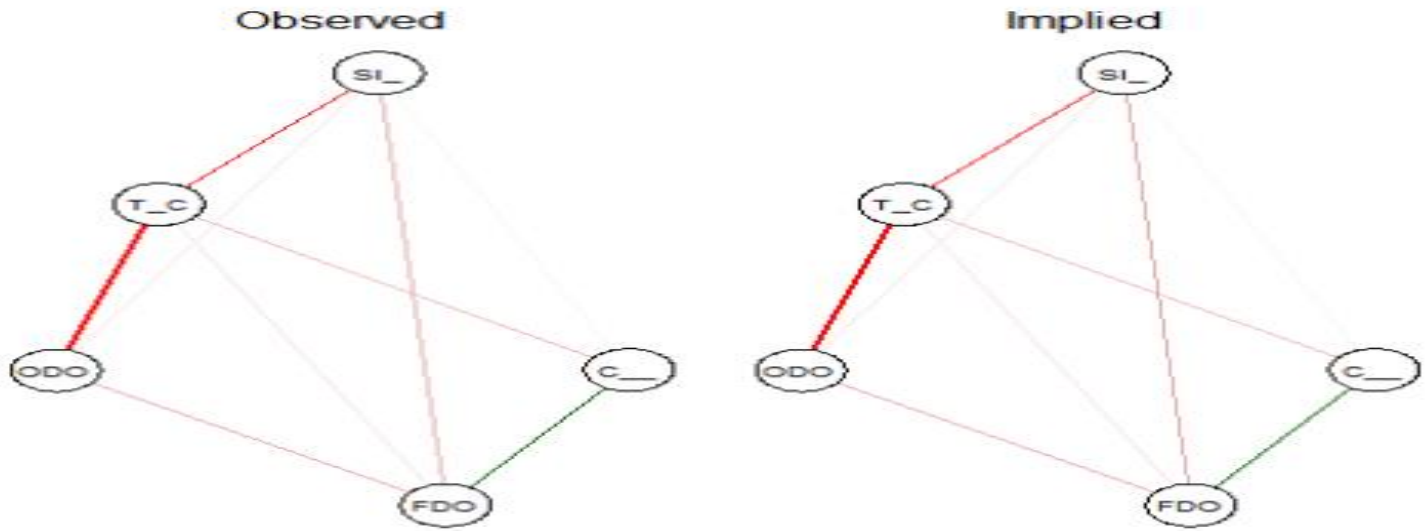


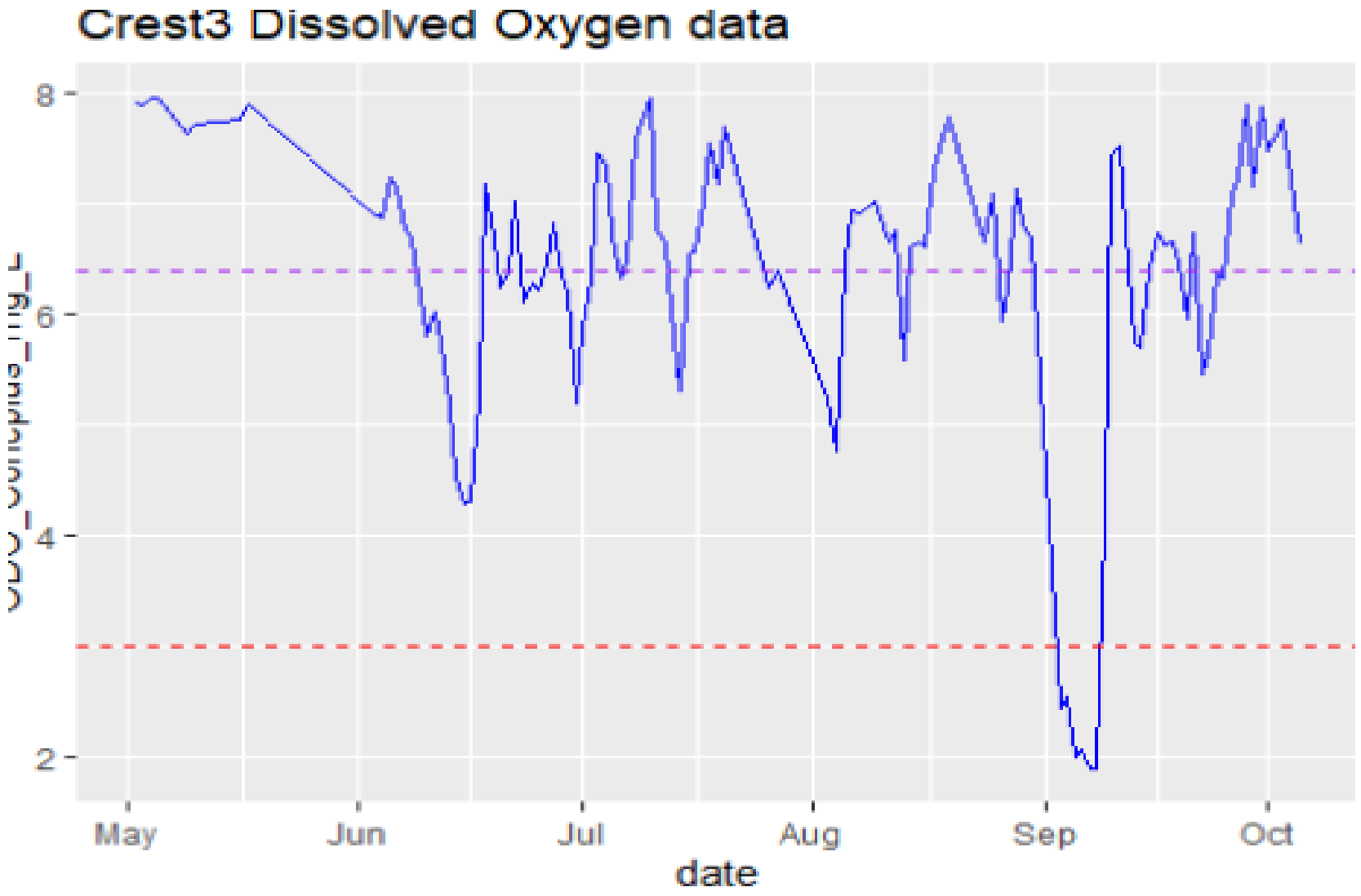
The main factors as seen from the Crest2 buoy data were Salinity (Sal_psu), blue-green algae (BGAPE_ug_L), and temperature (Temp_C). Throwing out the high outliers at the end of May, and realizing that low salinity, high water temperature, and high blue green algae counts are indicative of a warning the plot below was created. The data was normalized and scaled for Salinity, blue-green algae and temperature. The Early warning line was then derived by adding the blue-green algae, and temperature line and subtracting the salinity line. Dissolved oxygen was seen as a lagging factor from this dataset, with significant impact occurring in September which is consistent with a dying algae bloom (because salinity level were on the rise at that time the low dissolved oxygen event, it was probably not due to high canal outflows.)



The Pearson correlation tests on the Crest2 data did not uncover as many relative correlations as the Crest3 data. There was a high positive correlation between Chlorophyll and blue-green algae, and a moderate negative correlation between temperature and dissolved oxygen.






Crest3 Dissolved Oxygen data
8
6
4
2
May
Jun
Jul
Aug
Sep
Oct
date

Analysis

Drainage canals are sources of phosphorus and nitrogen based nutrients entering the Biscayne Bay ecosystem. Because of in place flow control structures, most of the water in the canal system can be reduced to standing water with no flow occurring at all. Standing water increases evaporation from the canal system, concentrating nutrient based pollution. Being able to discern canal, rain and ground water in Biscayne Bay was research done by Jeremy C. Stalker, René M. Price and Peter K. Swart. They determined that canal water has a stable oxygen geochemical tracer that had a heavy isotopic signature due to evaporation which differed from rain and ground discharge water.

The FIU Crest 3 buoy data showed that outflows from the little river canal (c-7), reduces salinity and dissolved oxygen in the canals/tidewater interface. High dissolved organic matter reading were also taken at the Crest3 buoy. Over the sample of 5 months, dissolved oxygen was monitored between 3 and 4.34 (mean value) mg per liter for a significant part of that time. Aquatic life expires below 3 mg per liter.

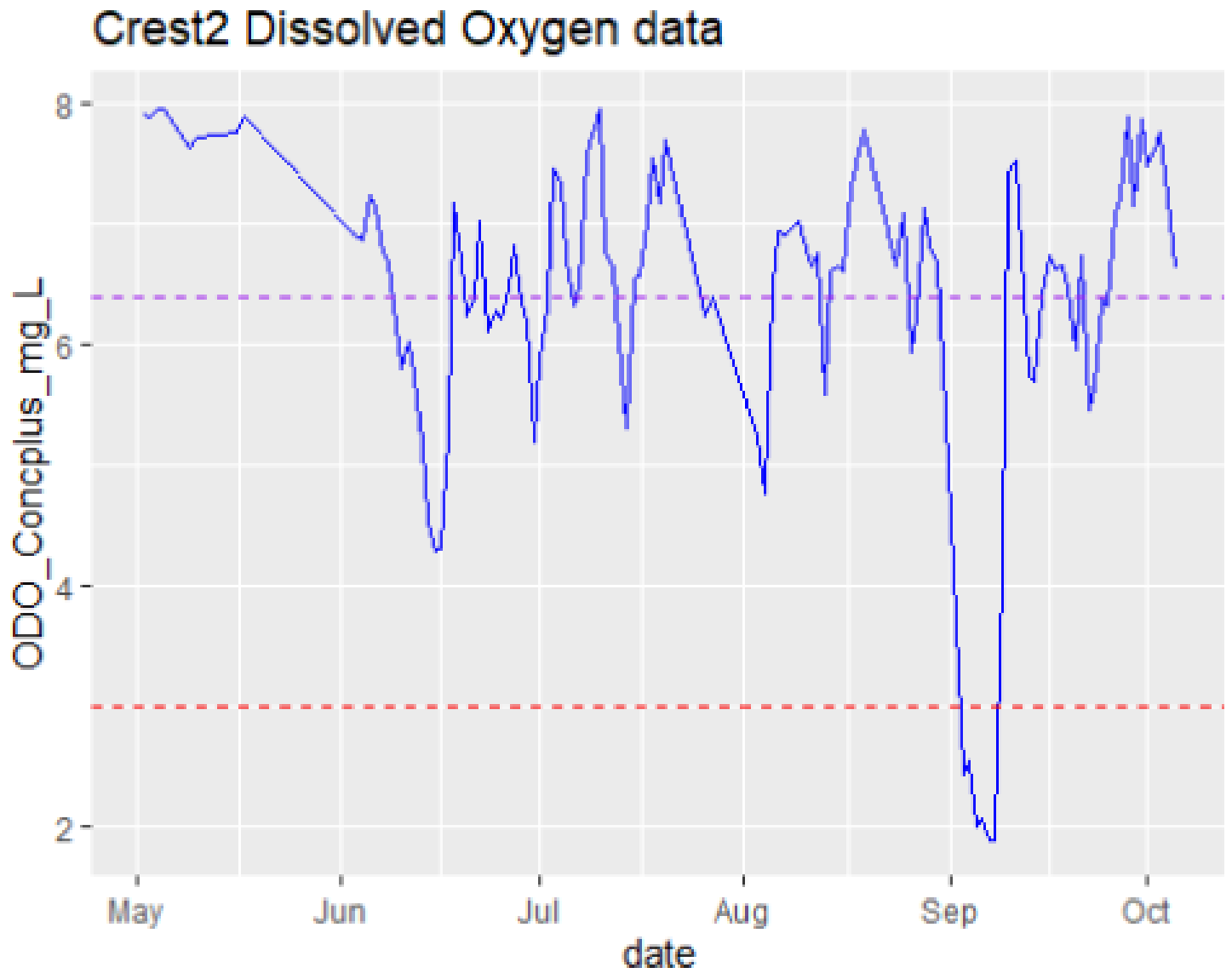
The Crest2 showed a significant rise in Blue-green algae (which is really a bacteria, Cyanobacteria) around the time of the August fish kill event. Cyanobacteria can produce toxins, which causes fish populations to die, as reported in a USGS study released October 18, 2018. One of the finds of the USGS report was ""When these freshwater algae get exposed to certain levels of salinity, their cell walls weaken, and the toxin they contain leaks out," said Rosen. "The point where the mixing of fresh and saltwater reaches that critical level where damage begins to occur will vary, depending on factors like the tides and the freshwater flow in the canals." Because North Biscayne bay is mostly shallow, light penetrates the majority of the bay's water column (except in area that have been heavily dredged). Light, nitrogen, phosphorus, and a minimum allowable salinity level are conditions that can cause a blue-green algae bloom to occur. And, rising Bay water temperature is always a plus.
The why and when Cyanobacteria creates toxins, however, is not exactly clear to biologists.

It is believed that Salinity levels of Biscayne Bay is one of the factors that the SFWMD uses to determine canal outflow into tidal waters. Canal water outflow is used to create a "buffer" between the ocean and the Florida coast to reduce salt water intrusion into the ground water of Miami-Dade County area. So it appears that the conditions for a blue green algae bloom are in line with the desire to maintain a low salinity buffer within the North Bay.

In an update on the fish kill from Miami-Dade County dated September 9th, it was reported that the epicenter of the fishkill was in the area of the 79th street Causeway which is between the Crest 3 and Crest 2 buoy locations. The report in part states that "There remain several areas where water quality has not recovered fully, and additional information will be gathered.". And, "FIU also had a team out yesterday, including a phycologist who is collecting data on microscopic algae to help determine if any particular species and/or concentrations of algae are playing a role in the fish kill." As well as ". DERM crews collected physical water quality parameters including dissolved oxygen, temperature and salinity to better characterize water quality in these areas…"

Besides detecting the increase in Blue-green algae at the Crest2 buoy, a low dissolved oxygen event wad detected at the beginning of September by both the Crest2 and Crest3 buoy.

Such a wide spread low oxygen event would be consistent with a algae bloom die off.


Crest2 Dissolved Oxygen data
ODO_Concplus_mg_L
8
6
4
2
May
Jun
Jul
Aug
Sep
Oct
date

Sources

AS S. FLORIDA GREW, SO DID CANALS, ROADS CARR By Michael Turnbell Transportation Writer SOUTH FLORIDA SUN-SENTINEL November 18, 2001

The Ecology and History of Biscayne Bay Posted by Stavros Mitchelides | Miami Beach Realtor in History https://www.miamirealestateguy.com/a-history-of-biscayne-bay/

Florida Department of Environmental Protection FINAL TMDL Report: Southeast Coast–Biscayne Bay Basins; C-8 (Biscayne) Canal (WBID 3285), C-7 (Little River)Canal (WBID 3287), C-6 (Miami River) Canal (WBID 3288), C-6 (Miami River) Lower Segment (WBID 3288B), and C-6(Miami) Canal (WBID 3290), Fecal Coliform; April 9, 20

https://cloud.xylem.com/hydrosphere/public-sites?customerId=OWA_D4FCEA1762484701A8D1891297DA823F&siteId=CRESTBUOY3

https://apps.sfwmd.gov/sitestatus/graphMulti.html?station=S27-S-QB,S27-H,S27-T&startDate=2021-09-2812:47:43:508&endDate=2021-10-0512:47:43:509

https://cloud.xylem.com/hydrosphere/public-sites?customerId=OWA_D4FCEA1762484701A8D1891297DA823F&siteId=CRESTBUOY2

https://www.floridamuseum.ufl.edu/earth-systems/blog/blue-green-algae-cyanobacteria/

Determining Spatial and Temporal Inputs of Freshwater, Including Submarine Groundwater Discharge, to a Subtropical Estuary Using Geochemical Tracers, Biscayne Bay, South Florida Jeremy C. Stalker & René M. Price & Peter K. Swart Estuaries and Coasts (2009) 32:694–708 DOI 10.1007/s12237-009-9155-y

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https://cityofwestmiamifl.com/index.asp?SEC=9C613BD2-D208-4A49-9DC5-F6586DEB80EC&Type=B_BASIC

https://www.miamidade.gov/releases/2021-09-09-rer-thurs-fish-kill-update.asp

This study changed our focus

My name is Marcos Pena CEO GreenPlanet Waterways Restorations Inc. I am a citizen scientist, who started a non- profit, dedicated to cleaning and restoring our waterways, using advanced testing and remediation. The waterway we are doing our testing in, is called Biscayne Bay, and is located on the Atlantic Ocean in South Florida. Currently we have two classes at two universities using our project in their curriculum, one of which FIU has helped us in taking our data and data collected from other sources to monitor the health of the bay and turning it into a usable dashboard that will allow us to monitor the bay for nitrogen phosphorus, dissolved oxygen and more. We started with developing one boat that could autonomously measure what is in the water and send it through a combination of up to 23 filtration devices and processes to remove forever chemicals, red tide, blue green algae, and much more. Our testing sent us upstream. Up the canals and waterways to the pollution sources.

During iteration we decided if we could do this and more as a citizen scientist, we could involve others and make great changes. The plan is to involve citizens who live on these waterways to become citizen scientist by placing monitoring and filtration devices on their docks or waterfront properties.

Contact information: Marcos Pena 900 Atlantic Shore Blvd. Hallandale Beach Florida 33009
786-676-3851 marcos@greenplanetwaterways

What can the citizen scientist add

- Report events
- Get involved by letting us use their dock
- Produce solutions
- Lower their carbon footprint
- Engage others
- Lobby the Government
- End use of plastics
- Stop littering

Example of citizen scientist involvement

- The commission in Miami were in the process of passing legislation to end the use of Mangroves and forbid them from being planted while making it mandatory to use concrete or rip rap.
- Individually we lobbied the powers that be.
- We spread the word so others would get involved with their commissioners.
- We banned together and wrote the following letter.
- We stopped the legislation.

The Honorable Mayor Francis Suarez
Mayor
City of Miami
3500 Pan American Dr.
Miami, FL 33133-5504

Dear Mayor Suarez,

The undersigned organizations are writing in objection to the proposed City of Miami ordinance, 11938, that would amend Chapter 38 of the City Code to establish certain requirements for City park and recreation waterfront improvements. We urge you not to pass this ordinance because it conflicts with existing environmental regulations and will not prevail against them. It also precludes the full array of possible project designs for shoreline improvement projects. Moreover, we would like to explain the multitude of vital benefits that mangroves confer to our community, environment, and economy. Last, we offer some constructive recommendations for resilient waterfront improvement projects to provide maximum value to the public.

Proposed ordinance and its effects:

The ordinance states that the purpose of this Article is to establish requirements for waterfront improvements at waterfront City parks and to "preserve waterfront views" for the parks. The language in the proposed ordinance would require waterfront improvement projects on City parks adjacent to Biscayne Bay or the Miami River to require the following:

1. All seawalls and bulkheads must be constructed on the shoreline and not inland;
2. Mangroves and tall-growing plants are prohibited from being planted in the water and on upland areas adjacent to the shoreline.

This ordinance would compel areas with vertical seawalls to stay as such, foreclosing options for resilient project designs. At shorelines currently without vertical armoring, this ordinance would appear to preclude upland alternatives in that it would require waterfront improvements to occur at the shoreline and therefore within the Biscayne Bay Aquatic Preserve, where sensitive resources like mangroves often already exist. For instance, if waterfront improvements were proposed at Kennedy Park, this ordinance would appear to force the project impacts to occur on existing mangroves at the shoreline. (We believe there is some confusion in terms. Seawalls and bulkheads are, by definition, constructed at the waterline. A landward structural feature holding the land is called a "retaining wall". After speaking with City staff, we understand that the intention of this verse is to prohibit landward bank stabilization by prohibiting structures such as upland retaining walls.) Lastly, this ordinance would prevent a coastal engineer from integrating mangroves in a shoreline defense strategy which would cheat the City a proven shoreline protection strategy that also simultaneously provides an array of other benefits.

We would like to inform you of the unintended consequences if the ordinance were to be passed.

City parks fronting Biscayne Bay and natural waterways are subject to Biscayne Bay Aquatic Preserve Regulations.

The Biscayne Bay Aquatic Preserve is codified at 258.397 F.S. and 18-18 F.A.C. The Boundaries and Scope of the Preserve include all publicly and privately owned submerged lands, the water column over such lands, and publicly owned islands.[1] The Preserve consists of natural waterways tidally connected to the Bay, such as the Miami River, and stops at the surveyed mean high water line.

The intent of the Aquatic Preserve Rule is to preserve and enhance Biscayne Bay in its essentially natural conditions to maintain its biological and aesthetic values.[2] The Rule defines "essentially natural conditions" as "those conditions which support the continued existence or encourage the restoration of the diverse population of indigenous life forms and habitats to the extent they existed prior to the significant development adjacent to and within the preserve." The Preserve is administered and managed in accordance with certain goals, including:

- Encouragement of activities that protect or enhance the biological and aesthetic values of the Preserve, including the modification of existing manmade conditions towards their natural conditions.[3]
- "Aesthetic value" is defined as "scenic characteristics or amenities of the preserve in its essentially natural state or condition...".[4]
- Preservation of and promotion of indigenous life forms and habitats, including mangroves.[5]

Other governmental agencies, including counties and municipalities, can impose their own requirements provided that such requirements or authority are consistent with the Act and these rules.[6]

If the City wishes to fortify shorelines at and below the mean high water line at City parks, the City will need to apply for a permit from the Florida Department of Environmental Protection to do so and ascertain authorization from the Aquatic Preserve[7]—this is required irrespective of whether lands at and below the mean high water line are owned by the City.[8] The project proposal needs to be consistent with Preserve rules for FDEP approval.[9] Specifically, the preserve rules at 18-18.006(3)(b) state that there shall be no further use, sale, lease, or transfer of interests in lands held by the Board of Trustees of the Internal Improvement Trust Fund unless an applicant affirmatively demonstrates that:

- An extreme hardship exists[10]
- The project is in the public interest[11]

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[1] 18-18.002(1), F.A.C.,
[2] 18-18.001(1), F.A.C.,
[3] 18-18.001(4)(e), F.A.C.,
[4] 18-18.004(3), F.A.C.,
[5] 18-18.001(4)(f), F.A.C.,
[6] 18-18.013(3), F.A.C.,
[7] 18-18.006(1), F.A.C.,
[8] 18-18.007(2), F.A.C.,
[9] 18-18.006(3)(d), F.A.C.,
[10] 18-18.006(3)(b)(I), F.A.C.,
[11] 18-18.006(3)((b)(II), F.A.C.,

- The project is consistent with the Aquatic Preserve Rules[12]
- Shoreline protection structures within the Preserve are the only practicable alternative; there is no other reasonable alternative that would allow the proposed project to be constructed or undertaken outside of the Preserve [13]

This proposed ordinance is contrary to the intent of the Aquatic Preserve laws.

Prohibiting mangrove shorelines directly contradicts the intent of the aquatic preserve rule: to restore and enhance the essentially natural conditions (ergo, mangrove shorelines) that existed prior to significant development.

This ordinance would make it extremely difficult, if not impossible, to acquire environmental permits.

As proposed shoreline improvement projects would need to go through regulatory review, they would need to demonstrate that they meet State regulations at 18-18 F.A.C. and 18-21 F.A.C. Our understanding is that the State rule would prevail over the ordinance.

The project design would need to be proven to be in the public interest so would have to show that the social, environmental, and economic benefits of a new vertical seawall or bulkhead at the shoreline–and potentially on top of existing, state-protected mangroves– would outweigh the costs of planting mangroves and/or some combination of upland rip rap/retaining walls as part of the project design. The environmental regulatory community at local, state, and federal levels well knows that seawall refract wave energy, increasing wave height and keeping the bay turbulent, murky, and unhealthy. By contrast, living shorelines such as mangroves absorb wave energy, allowing more sediment to settle. New vertical bulkheads and seawalls will be a hard public interest sell when they have cumulatively changed the bay for the worse.

The project design would need to prove that it is "water dependent". This is defined in 18-21 F.A.C. as "an activity which can only be conducted on, in, over, or adjacent to water areas because the activity requires direct access to the water body or sovereign submerged lands for transportation, recreation, energy production or transmission, or source of water, and where the use of the water or sovereign submerged lands is an integral part of the activity".[14] Bank stabilization is not a water dependent activity (it does not need water to fulfill its intrinsic purpose as a boat dock would). A retaining wall can be built in the uplands while mangroves, other appropriate vegetation can be placed waterward. Moreover, the City would have to prove that there are no other reasonable alternatives outside the Preserve (i.e. upland) that exist. Waterfront parks like Kennedy Park, Peacock Park, and Morningside Park all contain sufficient room above the waterline and beyond the mangrove fringe to install upland structures like retaining walls and rip rap beads to help combat storm surge.

With respect to extreme hardship, Chapter 18-18 indicates that "self-imposed actions" would haunt the City. Verse states: "Extreme hardship under this act shall not be construed to include any hardship which arises in whole or in part from the effect of other federal, state or local laws, ordinances, rules, or

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[12] 18-18.006(3)((b)(III), F.A.C.,
[13] 18-18.006(3)(b)(V), F.A.C.,
[14] 18-18.006(3)(b)(V), F.A.C.,

regulations."[15] Therefore imposing a requirement for vertical seawalls and precluding other options would not be admissible under this rule as an "extreme hardship".

When projects like new seawalls with backfill undergo permitting through the Army Corps of Engineers, they are reviewed under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Section 404(b)(1) Guidelines[16] compel the applicant to rebut the presumption that there exists an upland alternative that would have less environmental impact. Additionally, the Corps' Section 404 review requires an applicant to find the Least Environmentally-Damaging Practicable Alternative; that is what will get permitted. Therefore, the ordinance's preference for seawalls/bulkheads at the shoreline and no mangrove plantings could be picked apart by the Corps and potentially denied through a cumbersome permitting process. Yet the Corps also has authorized a Nationwide Permit efficiency for living shorelines under the Nationwide 54[17], which expedites those cumbersome regulatory timeframes. This ordinance would prevent the City from pursuing a regulatory "easy button".

Proposing vertical seawalls over mangroves would compel expensive mitigation at federal, state, and local permitting levels. Further complicating matters, prohibiting mangrove plantings in parks would also preclude any on-site mitigation opportunities for projects and could backfire on the City in certain circumstances (for instance, where mitigation credits are sold out, when the City may be required to do mitigation themselves for a project, or when the City wants to do a mitigation project on behalf of a third party).

Mangroves provide significant benefits, including shoreline stabilization and surge protection.

Mangroves are vital to the Bay's health and the safety of the community, and there is no substitute. According to Gary Milano (who led DERM's Coastal Enhancements section before retiring after 35 years of service), planting mangroves is the single most important thing that we can do to bring Biscayne Bay back to a healthier state. They are the ideal buffer zone. They trap sediment from the land and improve water quality and water clarity by filtering runoff from upland areas.[18] They break up waves and absorb their energy, reducing the turbulence that keeps Bay waters unnaturally murky. They also protect the land from the Bay during storms by breaking up the waves before they can reach further inland[18]. Mangroves provide the primary productive food base of estuarine systems and are among the most productive plant communities found in the world. They provide habitat for 1,300 species of animals including 628 mammals, birds, reptiles, fish, and amphibians, including Florida state- and federally-protected endangered and threatened species, as well as species of special concern[18]. These values are so important to the State of Florida that they are protected by statute for the following reasons:

> *The Legislature finds that mangroves play an important ecological role as habitat for various species of marine and estuarine vertebrates, invertebrates, and other wildlife, including mammals,*

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[15] 18-18.004(11), F.A.C.,

[16] 40 CFR § 230

[17] The Nationwide 54 requires the project design to have a substantial biological component, and, where fringe wetlands are proposed, appropriate native plants must be used. Mangroves would be appropriate for our region. Reference the Federal Register for the NW 54 https://www.federalregister.gov/documents/2017/01/06/2016-31355/issuance-and-reissuance-of-nationwide-permits and its regional conditions at https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll7/id/7014

[18] South Florida Multi-Species Recovery Plan: A Species Plan-an Ecosystem Approach. 1999. U.S. Fish & Wildlife Service, South Florida Ecological Services Office. 34 pp.

birds, and reptiles; as shoreline stabilization and storm protection; and for water quality protection and maintenance and as food-web support. The mangrove forest is a tropical ecosystem that provides nursery support to the sports and commercial fisheries. Through a combination of functions, mangroves contribute to the economies of many coastal counties in the state.[19]

Bringing back mangroves would behoove our communities. Mangroves are already being used successfully for nature-based coastal defenses in Southeast Florida. The Nature Conservancy authored a review of seven case studies of green infrastructure integrated into restoration projects along the Atlantic coast of Florida.[20] The "green" components were determined by the features naturally found at each area. One project in particular, the West Lake Park Mitigation and Restoration Project in Broward County featured installing riprap and planting of 13 acres of mangrove wetlands. This project is considered a great success.

The beneficial effects of mangroves are not just limited to large acreages in pristine areas. Urban mangroves—those that are located in and around cities--also provide a multitude of benefits.[21] Mangroves in urban areas:

- Provide habitat for wildlife from birds to commercially and recreationally important fish species
- Create green space in populated areas
- Remove nutrients from waterbodies
- Help slow effects of storm surge and flooding

Restoration of even small mangrove areas can provide significant ecosystem services to residents.

Mangroves Offer Significant Greenhouse Gas Sequestration

Mangroves, salt marshes, and seagrasses are the most dominant blue carbon sinks in Florida.[22] (Blue carbon refers to organic carbon stored in marine ecosystems over long time spans.) Since mangroves have substantial canopy and biomass, they have the ability to sequester more carbon than salt marshes or seagrasses. Globally, mangroves average approximately as much carbon dioxide sequestration per hectare as tropical rainforests do.[23] One study found that the value of carbon sequestration that mangroves in the Caribbean provided was $6.7 billion per year.[24] In a city that is ground-zero for sea level rise, we should be the leaders in adapting to and mitigating the effects of climate change. This ordinance would directly conflict with the City of Miami's Greenhouse Gas Reduction Plan, which aims to be carbon-neutral by 2050; it would propel Miami *backward on its goal*

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[19] 403.9322(2), F.S.,
[20] The Nature Conservancy. 2014. Nature-based coastal defenses in Southeast Florida. 19pp.
[21] Reyes, G., Smyth, A., Reynolds, L. 2022. What are Urban Mangroves? https://edis.ifas.ufl.edu/publication/SS706
[22] Dontis, E., Radabaugh, K., Chappel, A., Russ, C., Moyer, R., 2020. Carbon storage increases with site age as created salt marshes transition to mangrove forests in Tampa Bay, FL (USA). Estuaries and Coasts, 19pp.
[23] The Nature Conservancy. 2021. The Blue Guide to coastal resilience. Protecting coastal communities through nature-based solutions. A handbook for practitioners of disaster risk reduction. The Nature Conservancy. Arlington, VA.
[24] The Nature Conservancy. 2021. The Blue Guide to coastal resilience. Protecting coastal communities through nature-based solutions. A handbook for practitioners of disaster risk reduction. The Nature Conservancy. Arlington, VA.

Rip rap placed at the base of a seawall will not accrue an oyster reef under present conditions.

The ordinance encourages artificial reefs and oyster reefs so as "to increase fish population and improve a body of water's environmental health". However, this rationale does not consider the local state of our Bay. Historically most oysters grew on mangrove roots (not on "reefs"). Now, only about 1% of our local historic oyster populations survive because humans destroyed the mangroves and other conditions that made life possible. Because hydrological alterations, Biscayne Bay does not get enough

freshwater flow to support robust oysters. Therefore, the Bay and many of its natural waterways are presently too salty today to support reef building oysters[25].

Mangroves are vital to support recreational and commercial fisheries

Oysters and artificial reefs can never substitute for the many vital roles of mangroves. For example, over 70% of Florida's seafood and gamefish require mangroves in their life cycles. Sadly, most of the mangroves in North Biscayne Bay were wiped out over the past 100 years.[26]

Constructive Recommendations

It is true that public access to Bay views is important. The good news is that we can have both mangroves and views. The 1996 Mangrove Trimming and Preservation Act[27] allows mangrove trimming and alterations, including windowing, to preserve viewsheds. Regulations pursuant to this act allow for mangrove trimming such that the health of the tree and the habitat it confers can be preserved while allowing for people to view adjacent waterways. Areas that will require trimming to maintain vistas can be designated through a proactive covenant with state and county regulatory agencies.

We fully support responsible public access to our water. The City could also consider upland viewing platforms and elevated boardwalks. These would that allow pedestrians to traverse beyond the mangrove fringe. Provided that these structures can meet regulatory requirements and can demonstrate environmentally-friendly designs (for instance by including light transmissive decking and narrow width), pile-supported platforms could provide both bay views and an immersive, educational and recreational experience by allow pedestrians to walk through a lush and verdant vegetative fringe.

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[25] L. Eldrege, Biscayne Bay Aquatic Preserve Manager (personal communication, May 25, 2022).
[26] South Florida Multi-Species Recovery Plan: An Ecosystem Approach. 1999. U.S. fish&Wildlife Service, South Florida Ecological Services Office. 34 pp.
[27] Sections 403.9321-403.9333, F.S.,

Conclusions:

The City should not prevent mangrove planting at City parks nor should seek to build seawalls where mangroves are already present:

- State laws and regulations at 258.397 F.S. and 18-18 F.A.C. will prevail over this ordinance.
- This ordinance would force project designs that could make it very difficult, if not impossible, to get through the environmental permitting process. Stalled projects could cost the City a lot of money.
- Mangroves offer a multitude of human and environmental benefits that would maximize the full use and enjoyment of City park land.
- Mangroves help to reduce waves and slow the effects of storm surge
- Mangroves provide greenhouse gas sequestration
- Mangroves are vital to healthy fisheries and the fishing industry
- Mangroves help the City of Miami meet its greenhouse gas reduction targets. Oyster reefs will not survive in Biscayne Bay's current water conditions
- The City can get mangrove trimming permits to preserve viewing corridors. It could also consider pile-supported structures to allow people to view the bay beyond the mangrove fringe.
- The coastal engineers and consultants are the appropriate professionals to recommend the best shoreline protection strategy and need every tool available as our coastline changes. They should not be hamstrung by a proscriptive ordinance that prohibits one of our best resiliency tools while adding additional and contradictory bureaucratic red tape.

Signed,

Sam Van Leer
President & Founder
Urban Paradise Guild

Dr. Rachel Silverstein
Executive Director & Waterkeeper
Miami Waterkeeper

Vivian Belzaguy
Founder
Ascendance Sustainable Events

The Biscayne Bay
Marine Health Coalition

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Jon Paul "J.P." Brooker
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Ocean Conservancy

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Association

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Sereia Films

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Thank You

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Growing Climate Solutions
Path to Positive
Southwest Florida