



Stormwater Management

Keeping Trash, Pollution and Nutrients out of Biscayne Bay

February 19, 2021 9AM-10:30AM US Eastern Time

About the Biscayne Bay Marine Health Coalition



Vision: A Sustainable and Healthy Biscayne Bay

The Biscayne Bay Marine Health Coalition (BBMHC) is a group of independent volunteers (our "*Steering Committee*") committed to promoting a healthy Biscayne Bay. We collaborate with local government agencies, academic institutions, businesses and nonprofits in order to achieve our goals.

Advocacy

Communication

Education

Founder

BBMHC Steering Committee



Luiz Rodrigues



Committee Chair
Camila Quaresma-Sharp



Albert Gomez



Dave Doeblar



Emilio Lopez



Irela Bagué



Patrick Shearer



Scott Stripling



Steve Sauls



Emilio Lopez

SOP Technologies, CEO
BBMHC, Steering Committee Member

American Public Works Association, South Florida Branch

Florida Stormwater, Erosion, and Sedimentation Control
Inspector (FSESCI)

Engineering & Manufacturing | Stormwater Focus | Community Collaboration

biscaynebayfl.com

Goals for Today



Share Public Works Experience

Inspire Action

Answer YOUR Questions



About Stormwater Pollution



As polluted water makes its way to the oceans, water quality can be affected, which often results in the **closing of local beaches due to unhealthy water conditions. Stormwater carries disease-causing bacteria and viruses.** Swimming in polluted waters can make you sick.

A study in Santa Monica Bay showed that **people who swim in front of flowing storm drains are 50 percent more likely to develop certain symptoms than those who swim 400 yards from the same drain.**



What are the origins of ocean plastic debris, and how does it leak into the ocean?

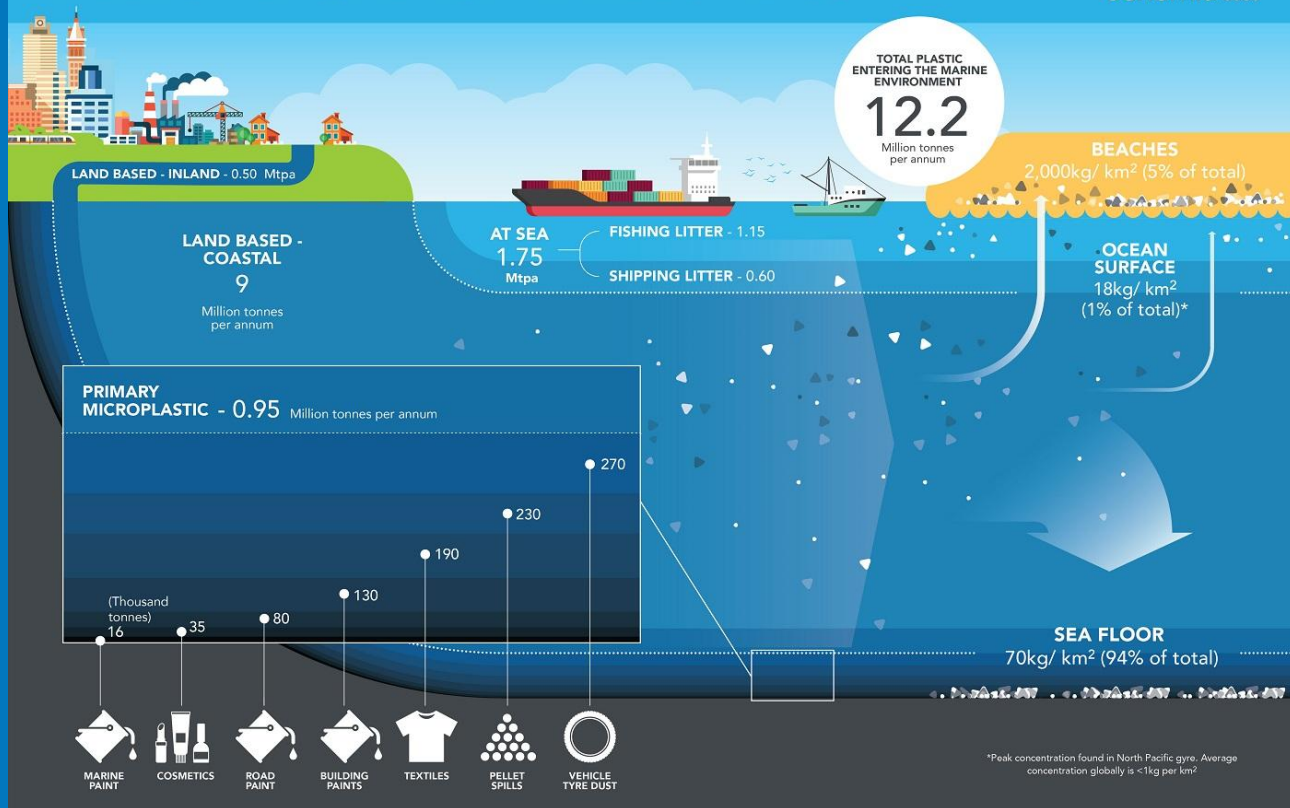
“over 80 percent of ocean plastic comes from land-based sources;

once plastic is discarded, it is not well managed, and thus leaks into the ocean.”¹

“19 to 23 million metric tons, or 11%, of plastic waste generated globally in 2016 entered aquatic ecosystems.”³

PLASTICS IN THE MARINE ENVIRONMENT: WHERE DO THEY COME FROM? WHERE DO THEY GO?

eunomia 



1. Ocean Conservancy <https://act.oceanconservancy.org/wp-content/uploads/2017/04/full-report-stemming-the.pdf>

2. Graphic: Eunomia <https://www.eunomia.co.uk/reports-tools/plastics-in-the-marine-environment/>

3. Science: <https://science.sciencemag.org/content/369/6510/1515>

Pollution Also Causes Flooding

“When it rains, water washes down the street, pushing plastics and other trash into the stormwater drain. Those openings on the curb were designed to capture rainwater and prevent flooding, not serve as public trash cans. But **researchers say more and more trash is making its way from those drains to the ocean.**”¹

“Never dump any waste in the storm sewers or canals within the City. It is illegal for any direct or indirect entry of any solid, liquid or gaseous matter to enter the drainage system. **Even grass clippings and branches can accumulate and plug channels.** A plugged channel or storm drain cannot carry water and **when it rains, clogged storm drains will cause water to back up into the street and may cause flooding.**”²

Inside a local stormwater basin ([video](#))



1. NPR: <https://whyy.org/segments/looking-to-cut-plastics-pollution-in-the-ocean-start-upstream/>

2. City of North Miami: <https://www.northmiamifl.gov/757/Flooding>



Local Issues and Actions

How much trash and debris enters local storm drains?



There are over 95,000 stormwater inlets/catch basins/grates in Miami-Dade County

Every year:

- **Over 16 Million pounds of leaves (nutrients) and trash entering stormwater inlets**
- Over 4,845 pounds of Total Phosphorus (TP)
- Over 10,070 pounds of Total Nitrogen (TN)

Mostly leaves
(nutrient pollution)



Lots of street litter



Per inlet, per year: Approx. 175 lbs of leaves (nutrients) and trash enter stormwater basins and pipes. 0.051 lbs TP 0.106 lbs TN*

*Based on data we collected in 2019 and 2020 at 3 cities, and with the collaboration of SENDIT4THESEA



Moral Responsibility to protect the Bay



Human Health



Marine Health





Bay Health = Economic Health

**Biscayne
Bay-related uses
generated \$6.9
billion in income
to southeast
Florida residents
in 2004**

**Direct, Indirect and Induced
Economic Contribution to Southeast Florida
Contribution is 4% of Southeast Florida's Economy**

Activity	Output (Million \$)	Income (Million \$)	Jobs	Tax Revenue (Million \$)
Recreation	\$3,992	\$2,243	58,800	\$272
Commercial Fishing	\$30	\$18	473	\$2
Port of Miami Shipping	\$8,895	\$4,259	77,048	\$368
Miami River Shipping	\$805	\$406	6,741	\$44
Total	\$13,722	\$6,926	143,062	\$686

Public Works Departments Survey

Responses included Public Works employees from



Public Works Survey: Acting Upon Task Force Recommendations



During the next 12 months, which of the following Biscayne Bay Task Force Recommendations do you support taking action upon within your jurisdiction?

3H	Eliminate direct and indirect stormwater discharges to Biscayne Bay.	✓✓✓✓
5F	Evaluate the various existing stormwater outfall systems in your jurisdiction to determine their effectiveness at preventing debris from entering Biscayne Bay.	✓✓✓✓✓✓✓✓
1G	Undertake and secure funding for new pilot projects and research projects focused on reducing pollution loads.	✓✓✓✓✓✓
5D	Conduct an analysis of marine debris in Biscayne Bay.	✓✓✓
5G	Identify and establish dedicated and recurring funding sources to pay for marine debris prevention and removal activities.	✓✓✓✓✓✓
3G	Develop a plan to prioritize the retrofitting of stormwater infrastructure within basins with the most substantial water quality and/or habitat degradation issues.	✓✓✓✓✓✓✓✓
3F	Enforce the existing code and update the stormwater design criteria to improve effectiveness and include advances in stormwater treatment technologies.	✓✓✓✓✓
4I	Accelerate green infrastructure solutions for flooding, resiliency, and water quality.	✓✓✓✓✓

Many options for maintenance and removal



LOWER OVERALL COST

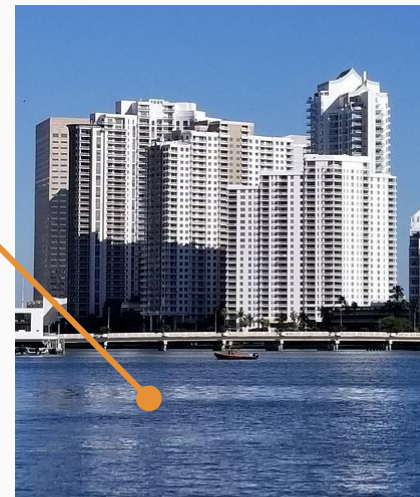
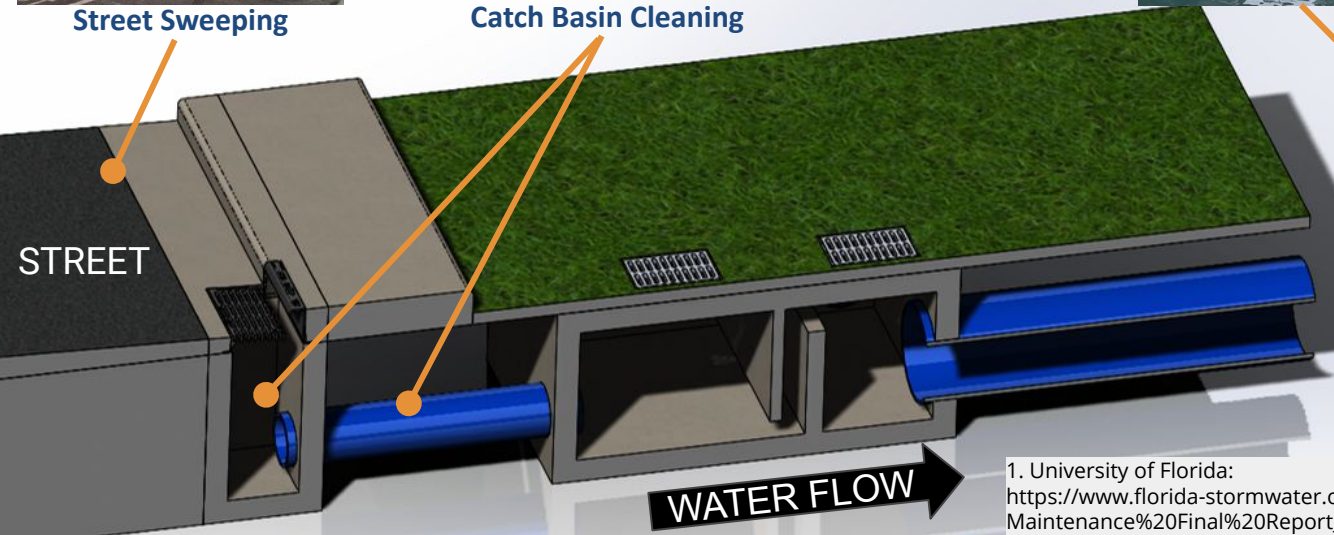
HIGHER OVERALL COST



Street Sweeping

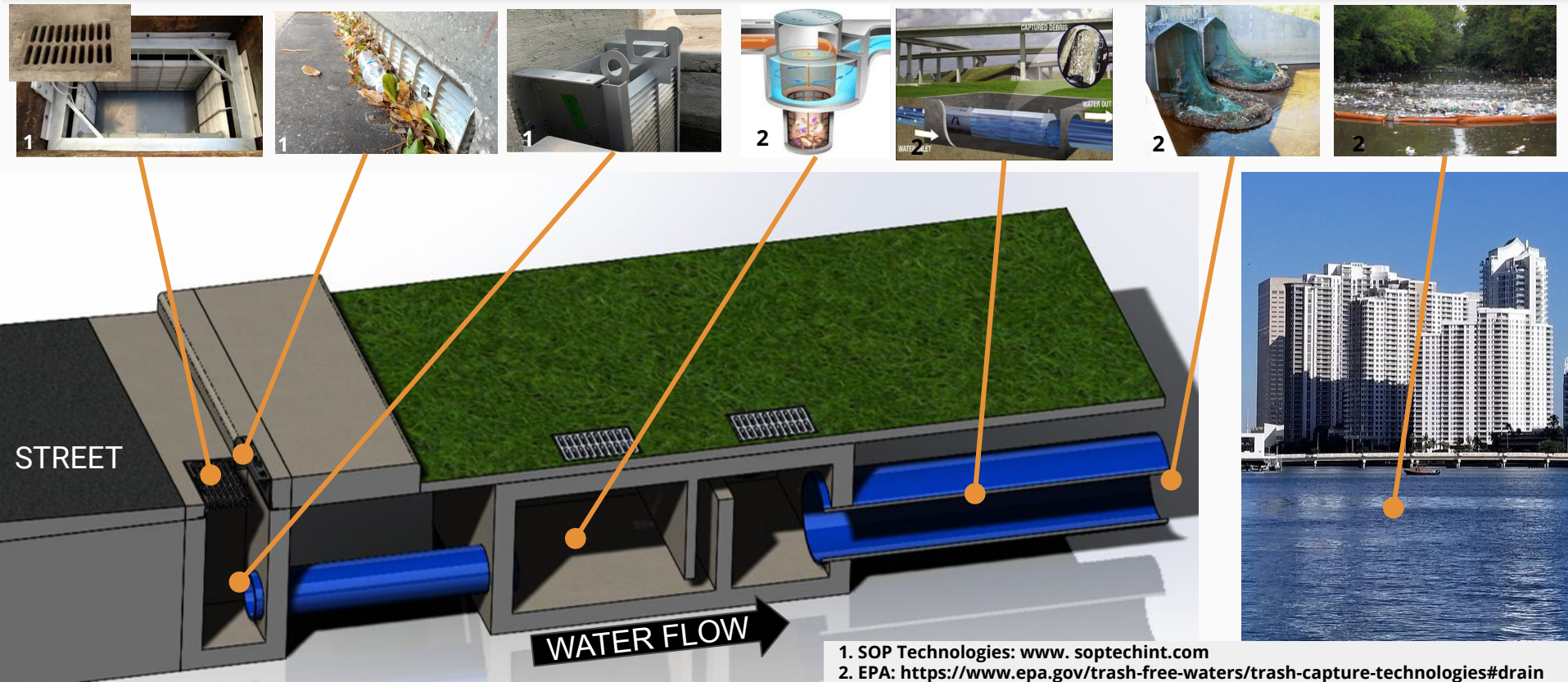


Catch Basin Cleaning



1. University of Florida:
https://www.florida-stormwater.org/assets/FSAEF/Research/MS4/UF%20FDEP%20MS4%20Maintenance%20Final%20Report_edited.pdf

Many solutions to capture trash and debris



1. SOP Technologies: www.soptechint.com

2. EPA: <https://www.epa.gov/trash-free-waters/trash-capture-technologies#drain>

Many Organizations Providing Support



- Engaging the youth
- Incorporating sports
- Scientific research
- Self-managed cleanups
- Advocating for new legislation



WE ARE NATURE



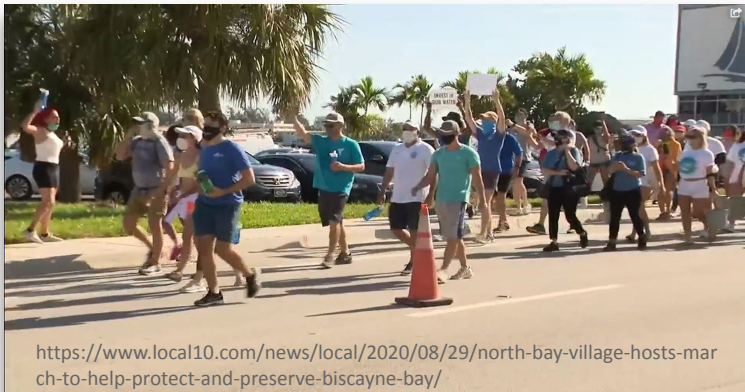
SENDIT4THESEA



Institute of
Environment



MIAMI



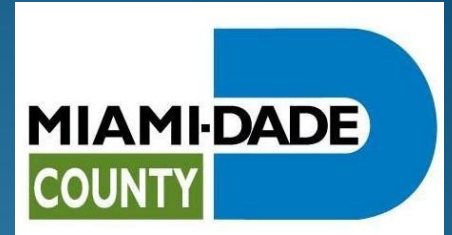
<https://www.local10.com/news/local/2020/08/29/north-bay-village-hosts-march-to-help-protect-and-preserve-biscayne-bay/>

Agenda



- *Poll*
- Intro (5 mins): Emilio Lopez, BBMHC
- Opening Remarks (5 mins): Irela Bague, Chief Bay Officer, Miami-Dade County
- DERM (10 mins): Mallika Muthiah, P.E.
- UF (20 mins with Q&A): Dr. John Sansalone, P.E.
- Public Works Presentations and Panel Discussion (45 mins): Moderated by Dave Doeblor, BBMHC
- *Poll*
 - City of Aventura (7 mins): Anthony Mihalko
 - City of Miami (7 mins): Alan Dodd, P.E.
 - City of Miami Beach (7 mins): Nelson Perez-Jacome, P.E.
 - Q&A
- Closing remarks (5 mins): Emilio Lopez, BBMHC

Miami-Dade County Stormwater Management



Mallika Muthiah, P.E.
Senior Professional Engineer
NPDES Program
Water Management
Division of Environmental
Resources Management (DERM)

Webinar: Stormwater Management:
Keeping Trash, Pollution and Nutrients
out of Biscayne Bay 2/19/21



Outline

- National Pollutant Discharge Elimination System (NPDES)
- Miami-Dade County's (MDC) NPDES Permit Requirements
- Surface Water Quality Monitoring
- Total Maximum Daily Load (TMDL)
- Source Tracking Options
- Nutrient Parameters
- Street Sweeping and Litter Collection
- MDC Collaboration with the Co-Permittees
- Challenges for Stormwater Personnel
- Public Outreach
- Takeaway actions for Stormwater Professionals

Note: Any data provided in this presentation pertains to
Calendar Year 2019

NPDES Permit

- Permit issued by FDEP, the regulator
- Permit issued to Miami-Dade County & 32 Co-Permittees
- Co-Permittees
 - Municipalities (except for City of Miami & Hialeah),
 - FDOT District VI
 - MDX, and
 - Florida Turnpike Enterprise
- City of Miami and Hialeah have their own permit
- Each Co-Permittee submits their NPDES Annual Report directly to FDEP

NPDES Related Activities

In MDC, NPDES activities are primarily performed by:

- Department of Regulatory and Economic Resources (RER)
- Department of Transportation and Public Works (DTPW)
- Water and Sewer Department (WASD)
- Department of Solid Waste Management (DSWM)
- Parks, Recreation, and Open Spaces Department (PROS)
- Florida Yards and Neighborhood (FYN)

NPDES Requirements (key)

Activities include:

- Inspections and maintenance of the Stormwater System and the Secondary Canal System
- Flood control Projects
- Street sweeping
- Inspections of industrial facilities
- Investigation of complaints
- Spill Prevention, Remediation, and Clean-up
- Permitting, and Inspections of Construction Activities
- Sedimentation & Erosion Control training
- Outreach Activities
- Surface Water Quality Monitoring

Stormwater Structures

- Exfiltration Trench/ French Drains
- Pollution Control Boxes
- Pump Stations
- Major & Minor Outfalls
- Weirs
- MS4 Pipes/ Culverts
- Inlets/ Catch Basins
- Canals
- Maintenance activities performed by PWD
- Engineering, Planning, and Inspections conducted by DERM

Stormwater System Inspections and Maintenance

Type of Structure	Number of Structures
Exfiltration Trenches/ French Drains	1,645,934 L.F.
Pollution control boxes	402
Pump stations	18
Major outfalls (387) + Minor outfalls County System only	387
Weirs or other control structures	15
MS4 pipes / culverts (miles)	282
Inlets / Catch basins / Grates	51,576
Canals/Ditches / conveyance swales (miles)	209

- French Drains, trenches, catch basins, inlets, drainage piping are maintained on a 3-5 year cycle unless an inspection finds an immediate risk, after storm events
- Outfalls are maintained on a 1-2 year cycle unless an inspection finds an immediate risk, after storm events
- Pollution control structures are maintained annually unless an inspection finds an immediate risk, after storm events
- Secondary canals are maintained with four cycles per year unless an inspection finds an immediate risk, after storm events
- Pumps stations are maintained weekly
- Adjustments are made if locations need more frequent maintenance; infrastructure is inspected annually, after storm events, and for complaints

Surface Water Quality Monitoring

- 107 active monitoring stations in Miami-Dade County
 - 66 stations are along the inland canals
 - 41 stations are in the Bay Region
- Miami-Dade County has entered into a Joint Interlocal Agreement with Co-Permittees
- The County conducts county-wide surface water quality monitoring and the cost is shared among the Co-Permittees
- MDC prepares annual water quality monitoring report and shares the report with the Co-Permittees

List of Surface Water Quality Monitoring Parameters |

Parameters	Monitoring Frequency
Total Ammonia*	Monthly
Dissolved Oxygen*	Monthly
Nitrate + Nitrite	Monthly
Total <u>Kjeldahl</u> Nitrogen	Monthly or Bimonthly
Total Nitrogen**	Calculated
Total Phosphorus**	Monthly
Chlorophyll-A**	Monthly
Total Suspended Solids	Quarterly
Copper, Zinc, Lead, Cadmium, Dissolved* (mg/L)	Annually (Freshwater sites) or Once every five years (Estuarine Regions)
Biochemical Oxygen Demand	Quarterly
Specific Conductivity (Salinity)*	Monthly
Escherichia Coli*	Monthly or Bimonthly
Enterococci*	Monthly or Bimonthly

* Parameters with established State or County Criterion

** Estuary-Specific Numeric Criterion

Total Maximum Daily Load (TMDL)

FDEP adopted TMDLs applicable to Miami-Dade County

Waterbody Name(s)	Waterbody Identification Number (WBID)	TMDL Parameter	F.A.C. Rule No.
C-7 Little River Canal	3287	Fecal Coliform	62-304.725
C-6 Miami River (Upper)	3288	Fecal Coliform	62-304.725
C-6 Miami River (Lower)	3288B	Fecal Coliform	62-304.725
Wagner Creek	3288A	Fecal Coliform	62-304.725

- There are only four TMDLs in MDC and they are for Fecal Coliform.
- FDEP has adopted new standards for E.Coli and Enterococci to use instead of Fecal Coliform.

Source Tracking Options

When high concentrations of a pollutant are detected in a water body, source of pollution must be identified and then eliminated.

- Walk the WBID (Water Body Identification)
 - Walk close to the water body and visually observe if there are any illicit discharge pipes to the canal, or other potential sources of the pollutant
 - Direct or indirect runoff from certain sources could cause pollution
- Additional water quality monitoring of outfalls/discharge points
 - If sampling results indicate high concentration of a parameter, continue upstream and collect samples in the stormwater structures. Continue until pollution source is located. Use GIS drainage maps.
- Source Molecular is DNA testing for bacteria pollution
 - To identify if the source is human, animals, birds, etc.)
- Closed Circuit Television (CCTV) monitoring
 - Can be used to look for damaged pipes, illegal connections, and cross-connections between sanitary sewer and storm sewer

Nutrient Parameter

- There are no set FDEP criteria for nutrients such as TP, TN, and Chlorophyll-A for the inland canal system.
- For canal system, assessment must be based on monitoring data collected and trend analysis
- However, Bay Regions have State established numeric nutrient criteria based on Annual Geometric Mean for TP, TN, and Chlorophyll-A

Table 7. Results of evaluation of Estuarine Regions in Biscayne Bay, as per 62-303.353. Exceedances of the criterion are typed in red.

NUMERIC NUTRIENT CRITERIA (NNC) of BISCAYNE BAY 2015-2019									
NNC Standard: The Annual Geometric Mean (AGM) shall not exceed the criterion more than once in any three-year period (62-302.532 (1) (h) FAC)									
List of Estuarine Regions: Card Sound (CS); Manatee Bay (MBS); North Central Inshore (NCI); North Central Offshore (NCO); North North Bay (NNB); South Central Inshore (SCI); South Central Mid (SCM); South Central Offshore (SCO); South North Bay (SNB)									
AGM for Total Phosphorus Concentrations (mg/l)									
Bay Region	CS	MBS	NCI	NCO	NNB	SCI	SCM	SCO	SNB
Criterion	0.008	0.007	0.007	0.08	0.012	0.007	0.007	0.006	0.01
2015	0.004	0.004	0.004	0.005	0.009	0.005	0.004	0.004	0.009
2016	0.002	0.003	0.003	0.003	0.008	0.004	0.002	0.002	0.005
2017	0.002	0.003	0.003	0.003	0.007	0.003	0.002	0.002	0.005
2018	0.003	0.004	0.005	0.003	0.009	0.004	0.003	0.003	0.007
2019	0.004	0.004	0.005	0.004	0.009	0.004	0.004	0.005	0.007

AGM for Total Nitrogen Concentrations (mg/l)									
Bay Region	CS	MBS	NCI	NCO	NNB	SCI	SCM	SCO	SNB
Criterion	0.33	0.58	0.31	0.28	0.3	0.48	0.35	0.24	0.29
2015	0.301	0.709	0.35	0.286	0.228	0.605	0.276	0.178	0.243
2016	0.287	0.539	0.317	0.23	0.301	0.39	0.303	0.119	0.188
2017	0.388	0.631	0.42	0.33	0.384	0.55	0.432	0.262	0.338
2018	0.307	0.569	0.383	0.353	0.314	0.476	0.335	0.197	0.283
2019	0.294	0.607	0.296	0.238	0.3	0.458	0.281	0.14	0.216

AGM for Chlorophyll (ug/l)									
Bay Region	CS	MBS	NCI	NCO	NNB	SCI	SCM	SCO	SNB
Criterion	0.5	0.4	0.5	0.7	1.7	0.4	0.2	0.2	1.1
2015	0.591	0.615	0.592	0.67	2.024	0.453	0.346	0.252	1.328
2016	0.515	0.634	0.619	0.779	2.055	0.526	0.424	0.333	1.277
2017	0.615	0.786	0.88	0.965	2.559	0.493	0.468	0.341	1.42
2018	0.526	0.722	0.659	0.712	1.823	0.42	0.426	0.245	1.619
2019	0.52	0.586	0.642	0.627	1.631	0.355	0.315	0.358	1.084

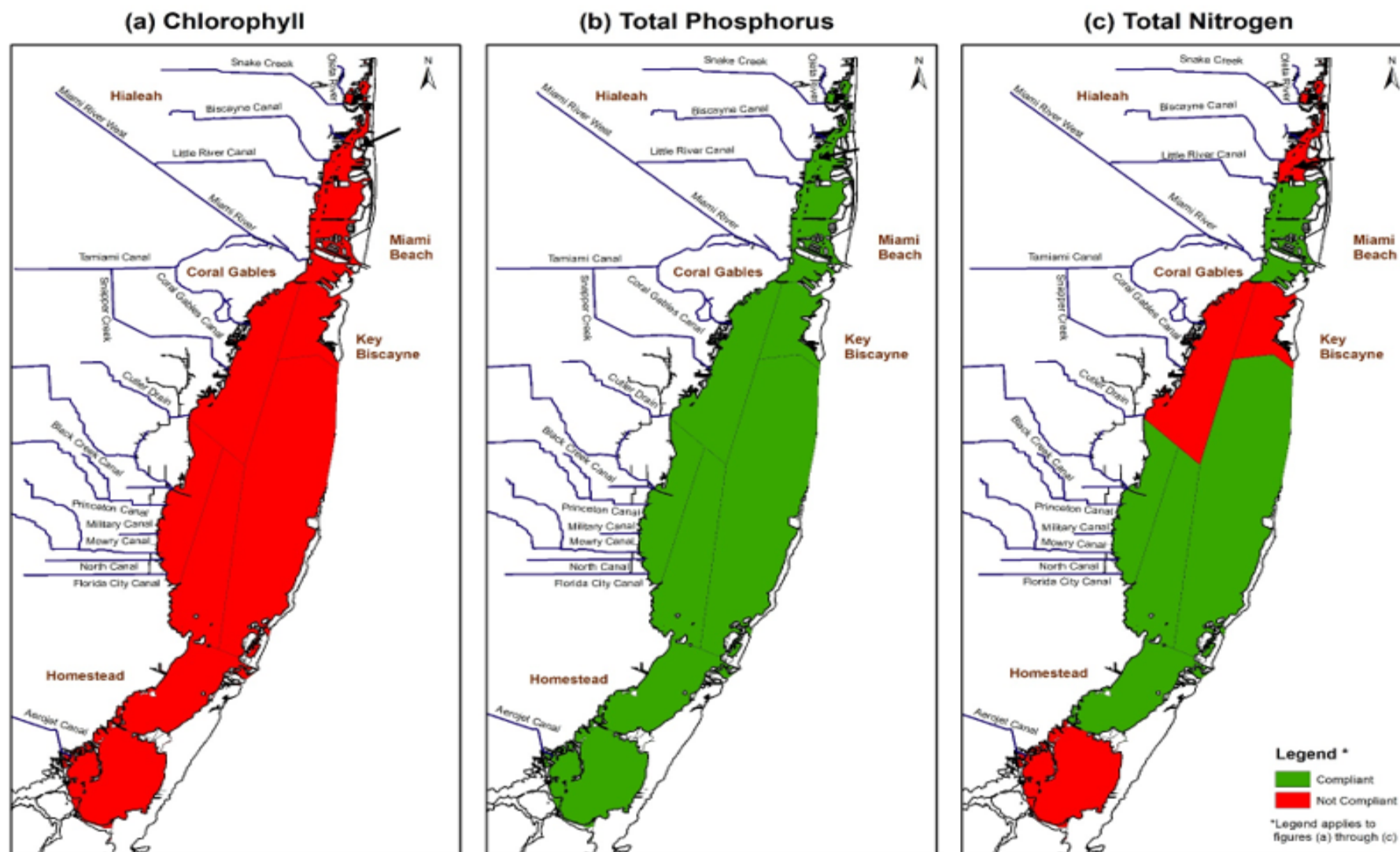
These are data for TP, TN, and Chlorophyll-A for the Bay Region from our water quality monitoring report. First row is state criteria. Subsequent rows are data for 2015 to 2019.

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Bay Region	CS	MBS	NCI	NCO	NNB	SCI	SCM	SCO	SNB
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2017	0.615	0.786	0.88	0.965	2.559	0.493	0.468	0.341	1.42
2018	0.526	0.722	0.659	0.712	1.823	0.42	0.426	0.245	1.619
2019	0.52	0.586	0.642	0.627	1.631	0.355	0.315	0.358	1.084

- No more than one exceedance in any 3-year period Rule
- Four (4) Bay regions non-compliant with the Total Nitrogen standard
- All nine (9) regions non-compliant with Chlorophyll-A Std.

Numeric Nutrient Assessment for Regions of Biscayne Bay 2019



Compliance = Annual Geometric Mean (AGM) does not exceeds criteria more than once in a consecutive three (3) year period.

Figure 9: Numeric Nutrient Assessment for Estuarine Regions of Biscayne Bay 2019

Trash and Nutrients Captured

The most economical option is not to let trash and debris get into the Bay.

- These operations are performed by Public Works
- The data pertains only to Unincorporated Miami-Dade County (excluding the data from municipalities)
- Street Sweeping
 - Total miles swept = 7,868
 - Frequency of street sweeping = 5.5 cycles in a year
 - Estimated quantity of sweeping material = 868 tons
- Debris removed from drainage infrastructure = 5,234 tons
 - Maintenance frequency is 3 – 5 years
- Total Nitrogen loadings removed = 4,038 pounds
- Total Phosphorus loading removed = 6,535 pounds

Litter Collection & Litter Control

- Performed under contract through Parks and Open Spaces Department (PROS)
- Roadways (Medians with Roadside curbs/swales)
 - Area maintained = 1,060 miles
 - 20 cycles a year
 - Litter collected = 780 cubic yards
- Roadside (Curbs and swales only)
 - Area maintained = 3,047 miles
 - 12 cycles a year
 - Litter collected = 423 cubic yards

MDC Collaboration with the Co-Permittees

- Surface Water Quality Monitoring data and report are shared with the Co-Permittees
- MDC compiles facility inspections, complaint investigation, and enforcement related information and provides them to the Co-Permittees for use in their annual report
- Organized a Co-Permittee meeting with the FDEP staff as the guest speaker prior to obtaining the current Cycle 4 permit
- Shares sample documents
- Responds to questions regarding NPDES requirements
- Shares public outreach brochures

Challenges for Stormwater Personnel

- Public awareness
- Excessive water and fertilizer use for landscaping
- Switch from septic systems to sanitary sewer connection may be costly
- Identification of specific sources of pollution may be difficult and expensive
- Deteriorating infrastructure may cause sanitary sewer overflows
- Sea level rise may affect infrastructure performance in the future



***Involvement of
multiple stakeholders:***

- ☐ Better understanding of sources of pollutants
- ☐ Better understanding of groundwater loading
- ☐ Enhancing operations and communications to optimize volume, timing and distribution of freshwater into the Bay
- ☐ Enhance environmental awareness + responsibility

DO SYNERGIES EXIST?

ADDITIONAL TIPS

Make sure that only rain water gets into the storm drains and storm sewer system by properly disposing of trash, debris, pollutants, and other contaminants. Do not throw away or discharge such items into the rivers, canals, lakes, bays or any waters in Miami-Dade County.

- For surface water quality questions or concerns, call the Division of Environmental Resources Management (DERM) at 305-372-6529 or visit www.miamidade.gov/environment.
- For information regarding stormwater, visit www.floridadep.gov/water/stormwater.
- To report illegal connections, dumping of any liquid or materials into storm drains or water bodies throughout the County, contact the DERM Environmental Complaint Desk at 305-372-6955 or environmentalcomplaints@miamidade.gov, and your local municipality.



DEPARTMENT OF REGULATORY AND ECONOMIC RESOURCES
Division of Environmental Resources Management

STORMWATER MANAGEMENT
701 NW 1 Court, Suite 500 • Miami, FL 33136
305.372.6529 | www.miamidade.gov/environment

This brochure is a general guide and does not supersede the Miami-Dade County Code of Ordinances. Miami-Dade County provides equal access and equal opportunity in employment and services, and does not discriminate on the basis of disability.

"It is the policy of Miami-Dade County to comply with all of the requirements of the Americans with Disabilities Act."

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STORMWATER POLLUTION SOLUTIONS



It's all connected!



Takeaway Actions for Stormwater Professionals

- Enhance Street Sweeping operations
- Enhance stormwater infrastructure inspections & maintenance
- Allocate funds and incentives to facilitate switching from septic systems to sanitary sewer connections.
- Apply source tracking methods to facilitate identification and help eliminate pollution sources
- Reduce the number of sanitary sewer overflow incidents
- Promote Low Impact Development and Green Infrastructure
- Education and outreach:
 - “Only rainwater” into the storm water system
 - Planting of Florida friendly plants and trees
 - Keep the storm drains near the homes clean
 - Proper disposal of paints and household chemicals
 - Reporting of illegal dumping into water bodies

Other information available at:

Miami-Dade County Department of Regulatory & Economic Resources

- Flood Complaints
 - Water Management Division
 - (305) 372-6529
 - swu@miamidade.gov
- To report illegal connections, dumping of any liquid or materials into storm drains or water bodies:
 - Environmental Complaint Desk at 305-372-6955 or
 - environmentalcomplaints@miamidade.gov



Public Works Roundtable Discussion

Stormwater Management Keeping Trash, Pollution and Nutrients out of the Bay



Dave Doeblar

- Steering Committee Member, Biscayne Bay Marine Health Coalition
- Co-Founder, VolunteerCleanup.Org
- Accidental Activist
- Informal Researcher / Citizen Scientist



My journey started with
a day on the water





I would collect 75+ pounds of trash every week !



Top items I found

- Plastic shopping bags
- Plastic water/soda bottles and lids
- Styrofoam Cups / food containers
- Plastic Straws
- Plastic Food bags (potato chips) and wrappers
- Cigarette butts (not biodegradable)
- Cigarette pack plastic wrappers



Trash and Debris at the street level enters into the storm drains



Trash and natural debris from the street is allowed to go into the drains...



Pollution controls are only effective if cleaned frequently



Trash that makes it past overflowing pollution controls discharge to the waterway and sometimes clog the outfalls





The goal of this webinar is to highlight current and future opportunities to keep trash and nutrients from going into Biscayne Bay via the Stormwater system.

Our Panel

- Anthony Mihalko, City of Aventura Public Works & Transportation Department
- Alan Dodd, City of Miami
- Nelson Perez-Jacome, City of Miami Beach

Agenda for the Conversation

Poll Questions

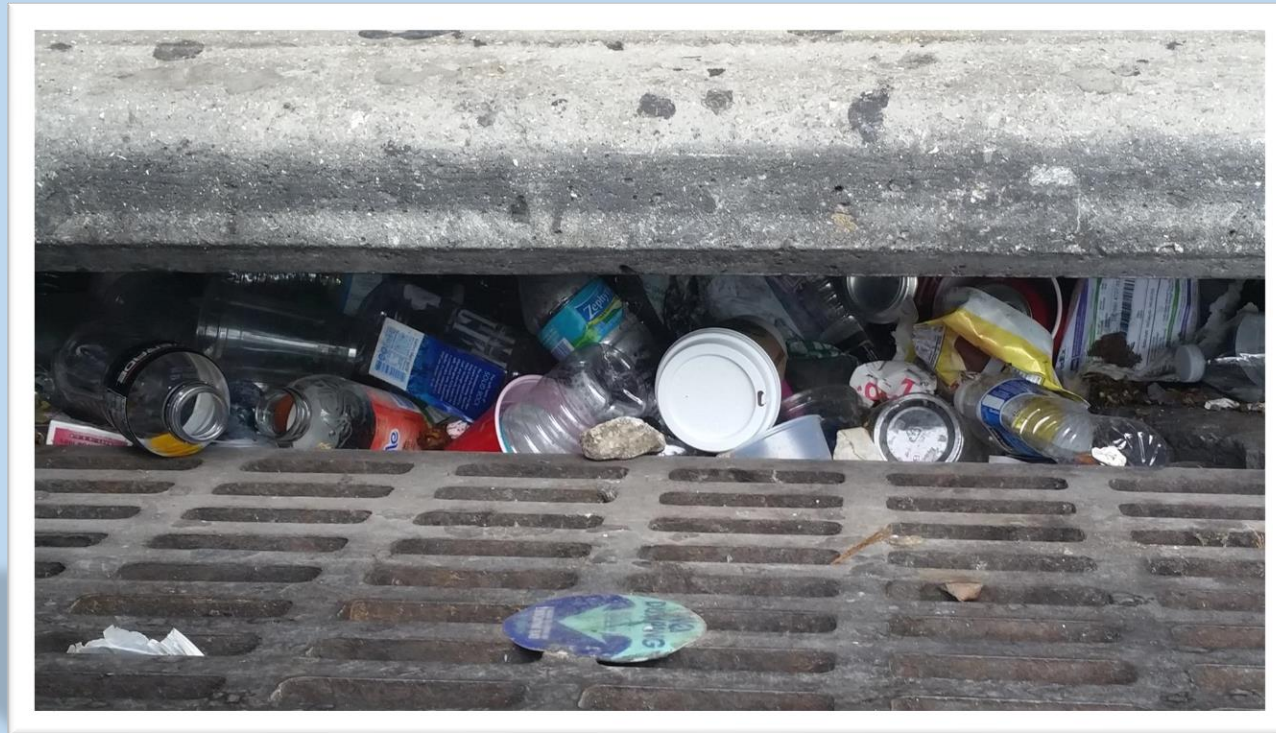
We asked each panelists to give us a quick overview of their cities

- Current Stormwater Infrastructure
- Maintenance Program
- Future plans and goals

Roundtable Conversations (attendees can ask questions in the Q&A)

Question 1:

What questions should elected officials and citizens be asking of their public works teams to determine if they have a good stormwater program?





Question 2

Florida DEP is currently reviewing and revising the MS4 permit resource manual that affects the entire state.

What would you like to see in the new permit? Guidance? Requirements? Oversight

Question 3

Our MS4 permit has 33 co-permittees that are authorized to put stormwater into the Bay, and it is obvious that we have some excellent talent in each of these 33 entities.

Are we doing a good job with collaborating and sharing best practices?
If not, how do we as a collective learn from each other and benefit from our shared experience?



Stormwater Management in the City of Aventura



Anthony Mihalko
Public Works
Stormwater Coordinator

- Florida Stormwater Association Stormwater Operator 2
- Bachelor of Science Degree Construction Management FIU
- City of Aventura Employee 1997 - Present

Webinar: Stormwater Management: Keeping Trash, Pollution and Nutrients out of Biscayne Bay 2/19/21

Overview of our Current Stormwater Infrastructure



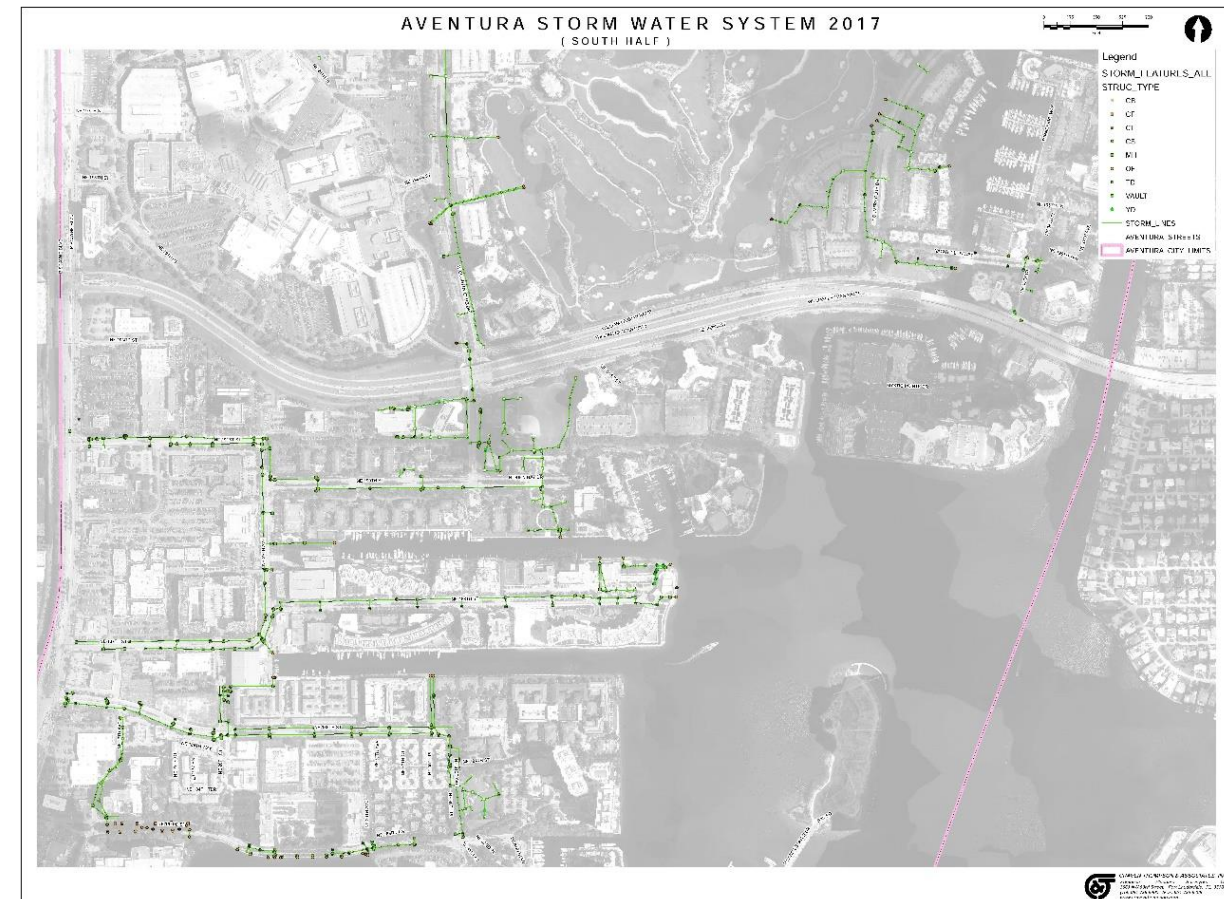
532 Inlets

258 Manholes

28 Control Structures

44 Well Structures

57 Outfalls



How we keep trash, debris and nutrients out of Biscayne Bay



Street Sweeping



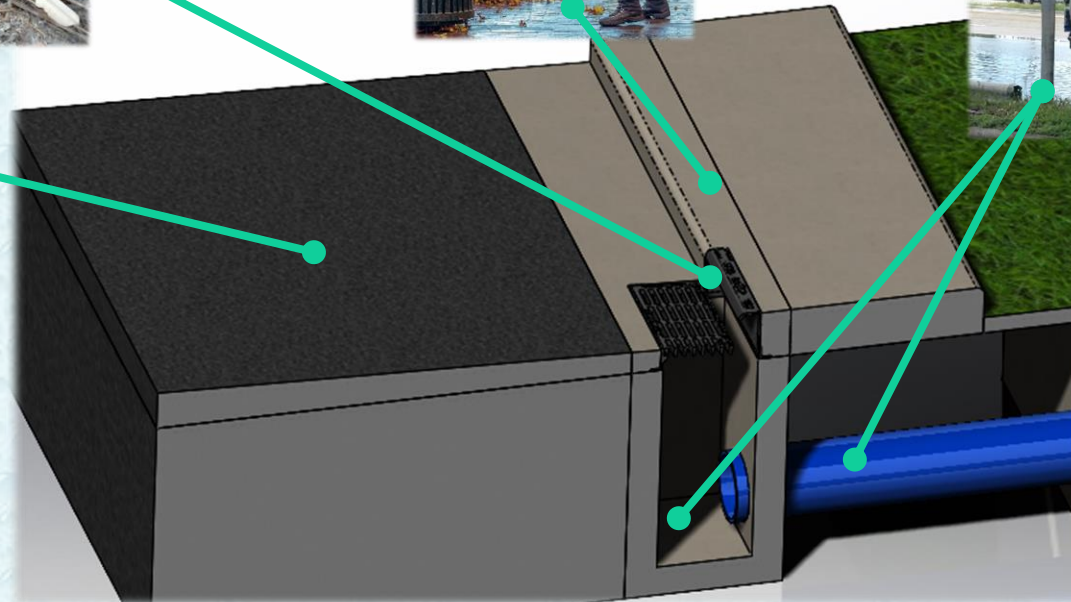
Curb Inlet Filters
Provided by SOP Technologies



Landscaping Staff



Jet Vac



Divers



Our Stormwater Maintenance Program



Activity	Frequency	Annual Debris Capture	Annual Expenditure (2020 data)
Street Sweeping (US Sweeping)	1x per week March-August Bi-weekly September – February	217 Cubic Yards	\$40,936 (US Sweeping)
Landscape Staff (Brightview Landscape)	Daily litter & trash pick-up	791 Cubic Yards	\$50,000 5% estimate (Brightview Landscape)
Jet Vac (Envirowaste & Johnson Septic)	Yearly Basins are visually inspected, and inspections done during rainfall events looking for standing water	38 Cubic Yards	\$7,102 (Envirowaste)
Divers (Aqua-Nautik Underwater)	Used as needed for specialty jobs. Vacuuming pipe and replacing check valves.	20 Cubic Yards	\$23,010 (Aqua-Nautik Underwater)
		Total Debris Capture 1,066 Cubic Yards	Total \$121,048

Our plans and goals for the future



- **What are our plans to reduce trash, debris and nutrients from going into Biscayne Bay?**
 - Created Ordinance 2017-12 providing for an enhanced stormwater management system.
 - Gather proof of maintenance and inspection records from commercial properties on a bi-annual basis. Starting in 2021 we are including condominium properties.
 - Continue working with our building department to inspect demolition projects making sure proper BMP's are in place and continue to monitor as construction projects progress.
- **What are the obstacles to improvement?**
 - Budget
- **If money was not an issue, what would you do?**
 - Install wireless monitors at each catch basin that determine the level / amount of debris inside a basin so I can schedule a jet-vac to clean



Stormwater Management in the City of Miami



Alan Dodd, PE
Chief Resilience Officer

Webinar: Stormwater Management: Keeping Trash, Pollution and Nutrients out of Biscayne Bay 2/19/21

City of Miami Stats and Stormwater Infrastructure



Population 470,914

Area 55.25 Square Miles

Average Elevation 6 ft (1.8m) feet above sea level

Shoreline

Seawalls Bayside 41.85 Miles

Seawalls Riverside 6 Miles

Natural Shorelines 40.59 Miles

Stormwater System

Underground Pipe 100.3 Miles

Inlets/Catch basins/Grates 28,152






Outfalls 486 (86 major)

Pump Stations 13

Grass Swales 15.5 Miles

Covered Ditches/Conveyance Swales 43.8 Miles

Debris Reduction Strategies

Maintenance	Technologies	Community Collaboration	Legal / Policy
<ul style="list-style-type: none"> Street Sweeping Waterway cleaning – Scavenger 2000 Canal cleaning contract  	<ul style="list-style-type: none"> Inlet Screens and Trash Baskets   	<ul style="list-style-type: none"> Keep Miami Beautiful Cleanups 	<ul style="list-style-type: none"> Glysophate ban Fertilizer ordinance restricting use during rainy season Polystyrene ordinance prohibiting products in parks, recreation facilities NPDES program Illicit Discharge Program for reporting and stop work orders at construction sites

Our Stormwater Maintenance Program



Annual Cost - \$14,406,000 (FY 2020)

Solid Waste Department

Street Sweeping – 45,737 tons of debris removed

Keep Miami Beautiful Program – 106 tons of debris removed

Department of Resilience and Public Works

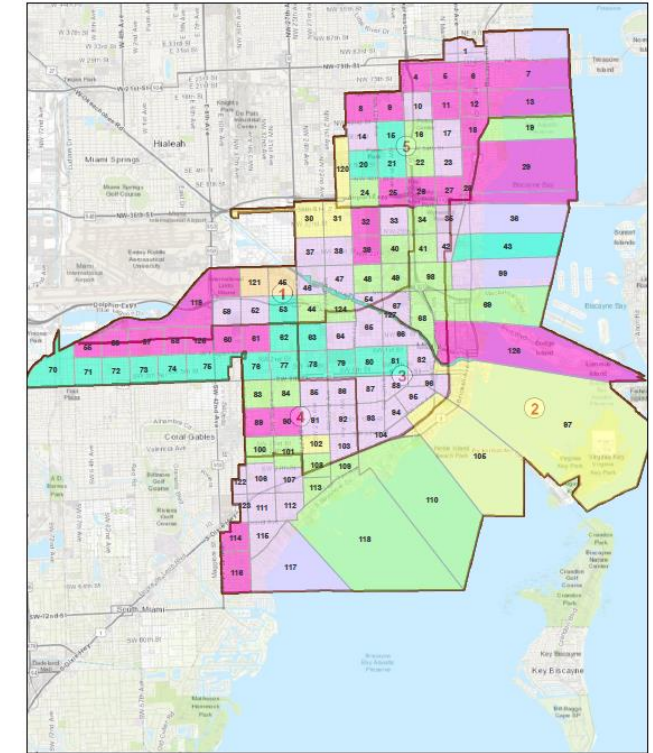
Canal cleaning contract – 84 tons of debris removed

Waterway cleaning (Scavenger 2000) – 128 tons of debris removed

Stormwater System Cleaning– 582 tons of sediment removed

Vactor Trucks - 19,000 ft of pipe and 450 catchbasin/manholes per month

Pump station debris removal monthly





Our Future Plans and Goals

Stormwater Master Plan

Revised city standards to reduce outflow velocity and capture debris

Filters, baffle boxes, vortex units, tidal valves

Exfiltration trench, bioswales, and injection wells

Improved pump station designs with oil water separators, trash screens, and sediment removal devices

Seawalls – Raising elevations to improve resilience to tidal flooding

Curb Inlet Screens - 1000 funded this year will capture 135,000 lbs of debris annually

Solid Waste – Working to increase street sweeping

Deep Well Cleaning Contract

Miami Forever Climate Ready Strategy

Miami Forever Bond Funding



BIOSWALES



RECHARGE DRAINAGE
WELLS



EXFILTRATION
TRENCH



TIDAL CONTROL
VALVES



PERVIOUS PAVERS
& PAVEDRAIN



SEAWALL REPAIRS &
UPGRADES



PUMPING
STATIONS

Stormwater Management in the City of Miami Beach



Nelson Perez-Jacome, P.E.
City Engineer

- Professional Engineer
- Master Degree in Water, Wastewater, and Stormwater Engineering
- Consulting in US and Latin America

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Overview of our Current Stormwater Infrastructure

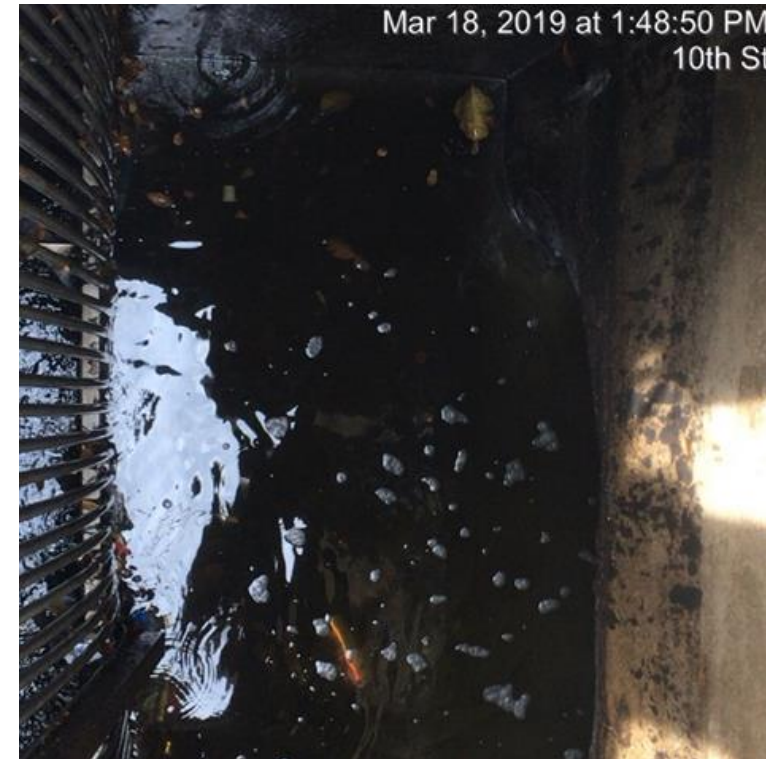
Storm Water System:

- **175+** Drainage Wells
- **48** Existing Pump Stations
 - **25** New Generation
 - **23** Old Generation
- **57** Planned New Stormwater Stations
- **120** Miles of Storm Water Pipelines, with culverts as big as 120" x 60"



Our Stormwater Maintenance Program

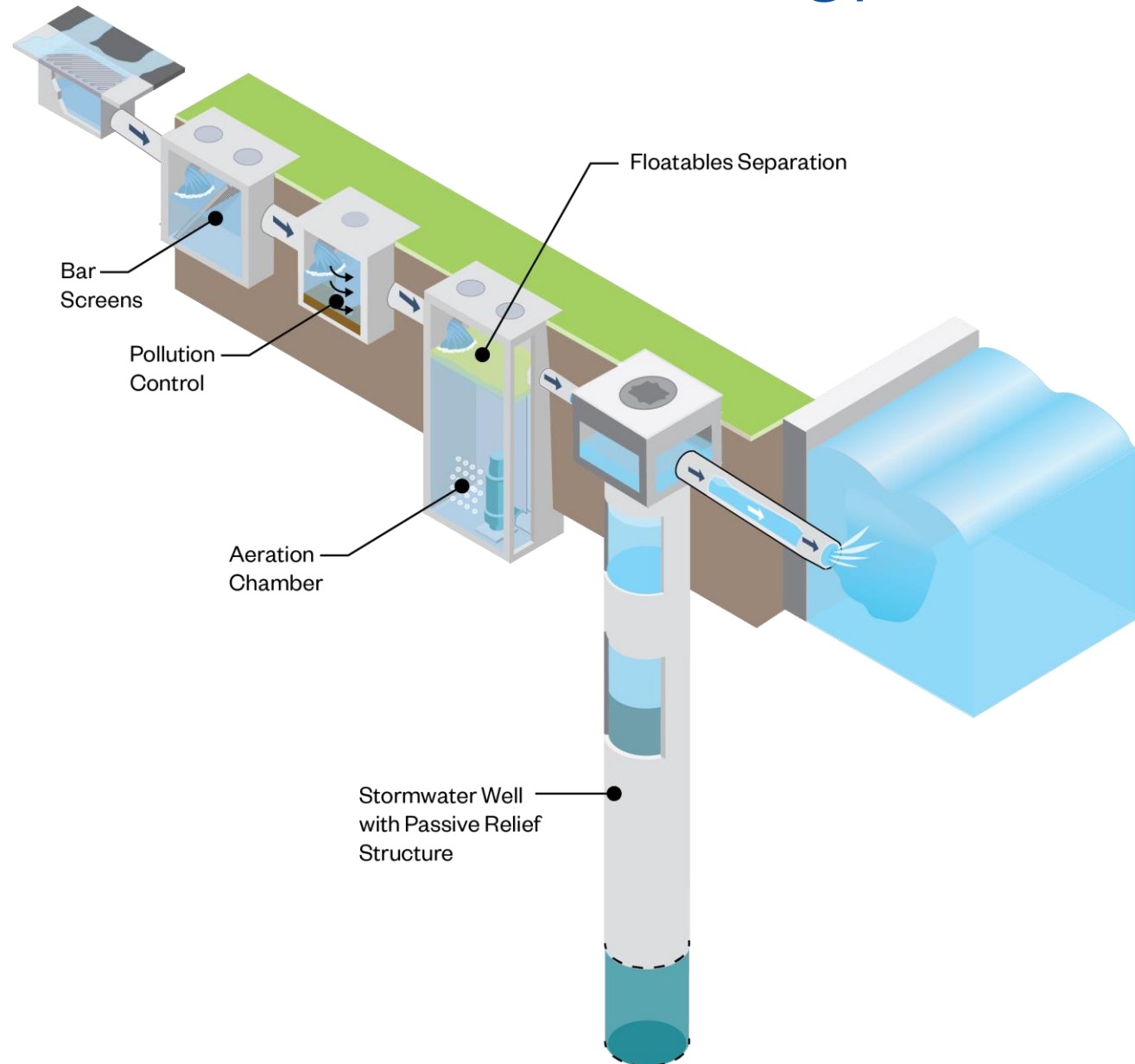
- Clean 190% of our system yearly
- Waterway cleaning frequency of three times per week.
- The City has removed approximately 1500 tons of debris annually for the past 4 years
- The City spend on average \$1.5 Million on maintenance program



Water Treatment Systems – Our Current Strategy

Water Quality Treatment Systems:

Five Stages of Treatment
Injection well to sequester
First Flush
Outfall for Large Storms

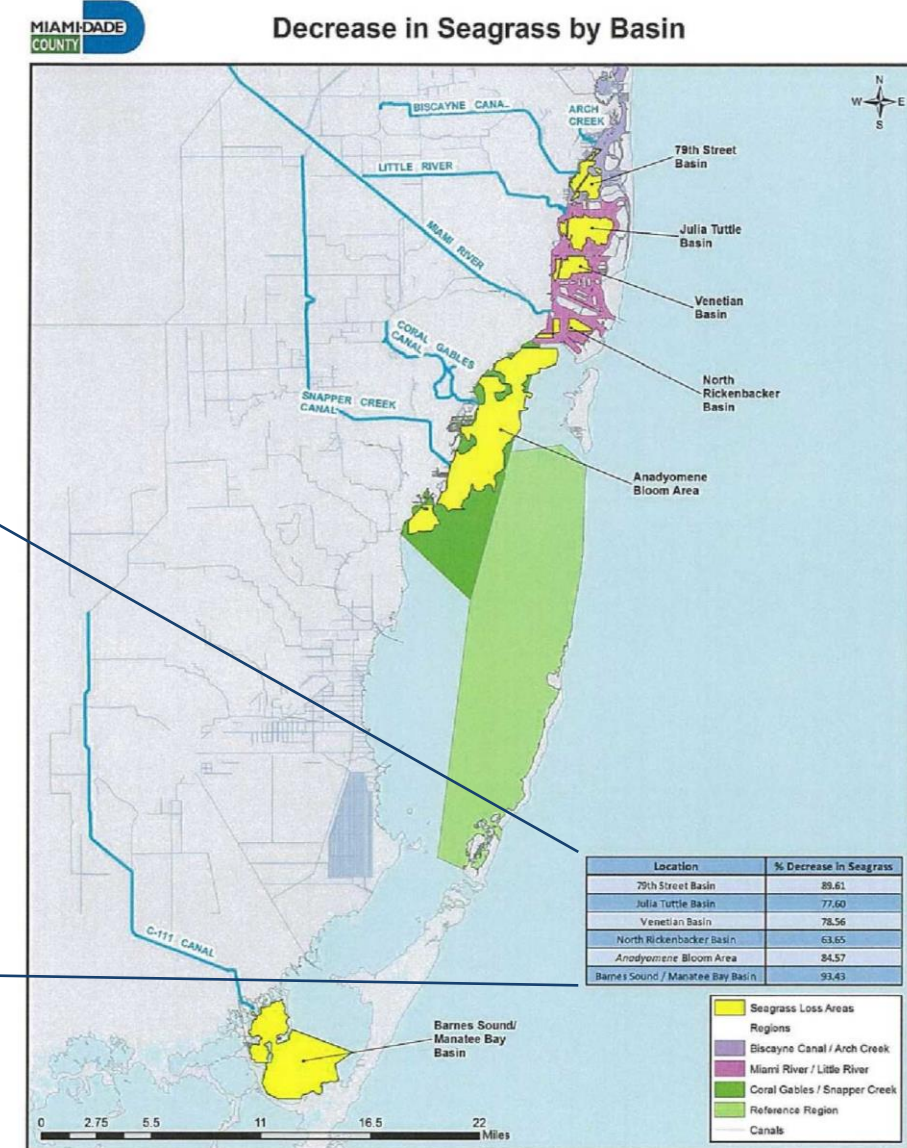


.... Miami Dade County reports:

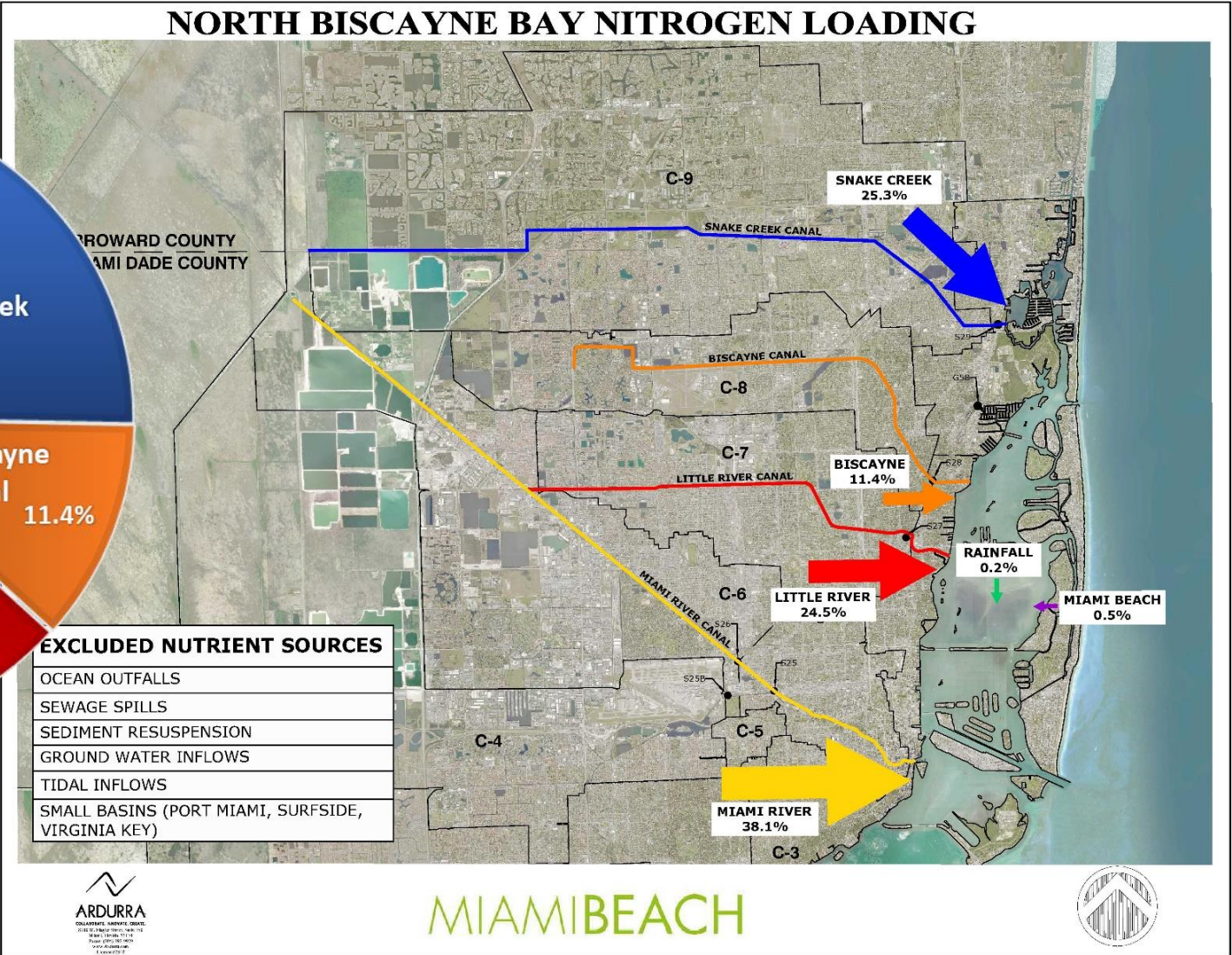
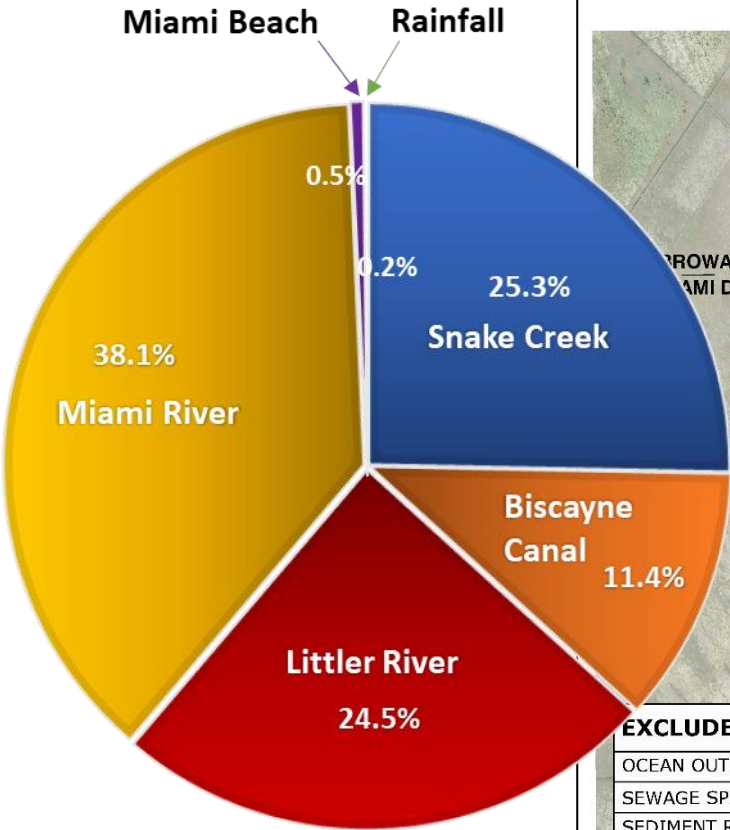
"Biscayne Bay has experienced seagrass die-offs, most notably several that have occurred within the last decade"

Location	Total Area (Acres)	Area of Seagrass Reduction (Acres)	% Decrease in Seagrass
79th Street Basin	1,441	1,291	89.61%
Julia Tuttle Basin	2,503	1,942	77.60%
Venetian Basin	1,232	968	78.56%
North Rickenbacker Basin	931	592	63.65%
Anadyomene Bloom Area	14,113	11,936	84.57%
Barnes Sound Basin - Manatee Bay	9,041	8,447	93.43%

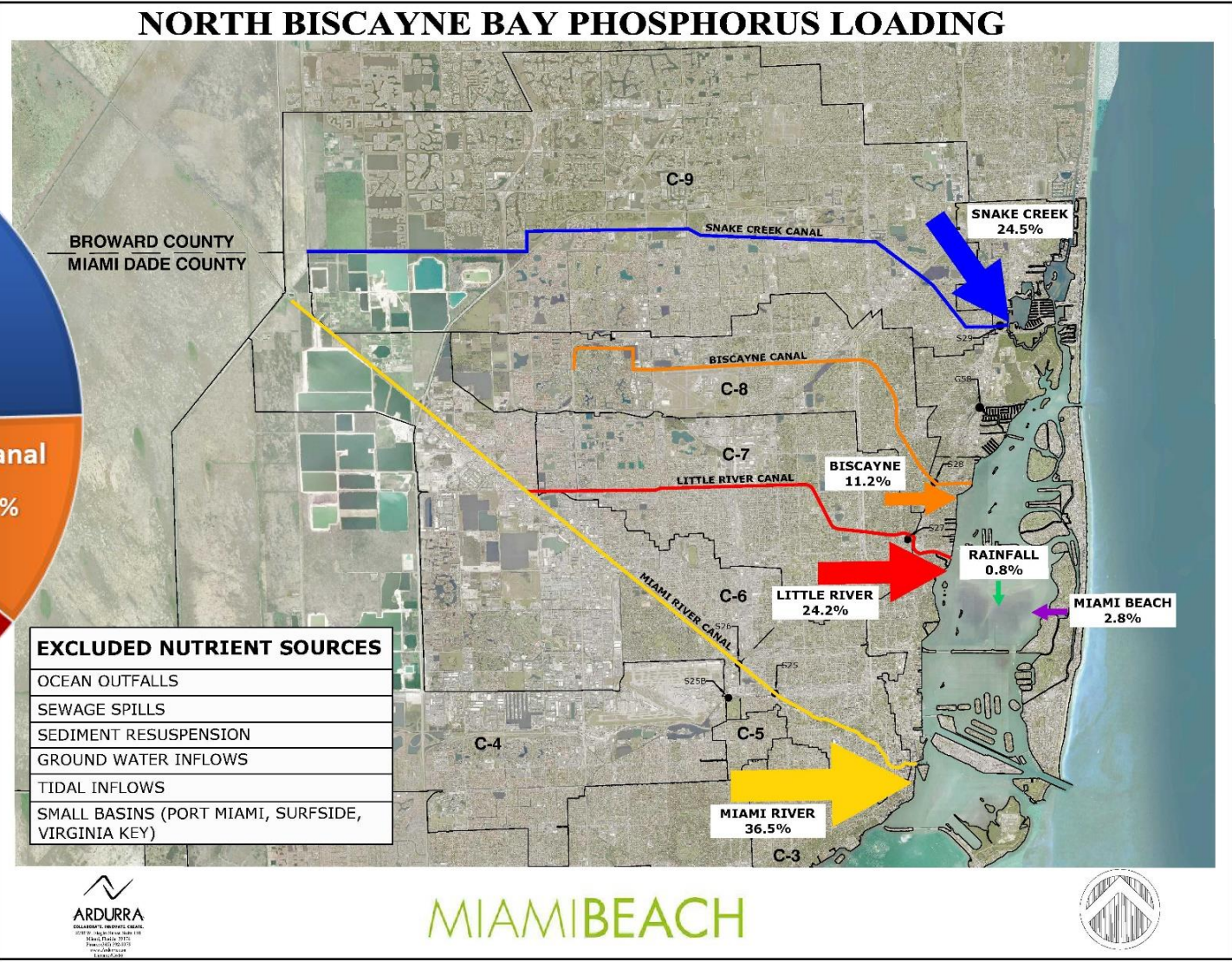
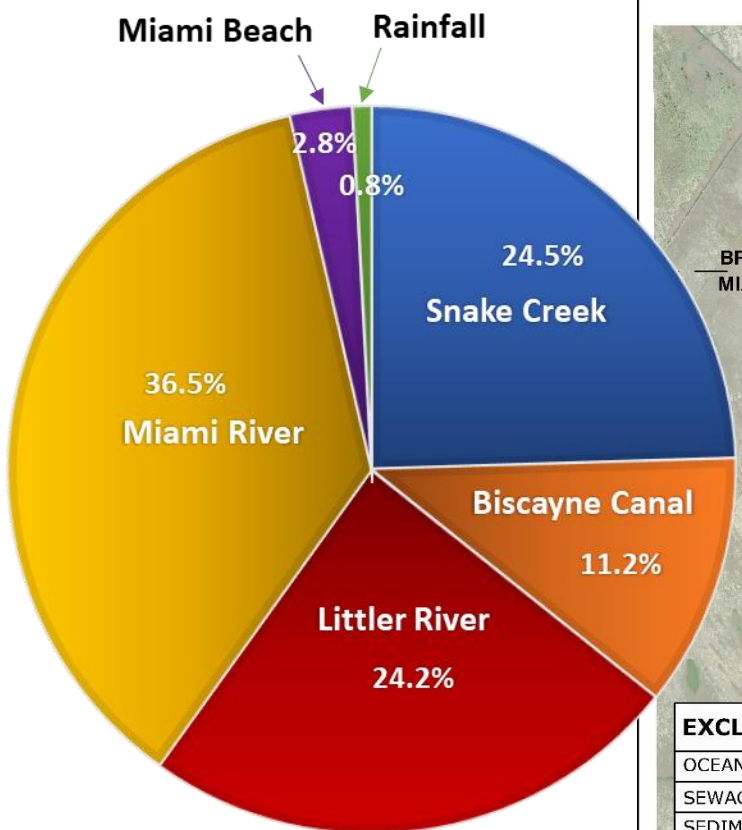
Figure 6. Study period 2005 - 2018.



Nitrogen Loading into Biscayne Bay



Phosphorous Loading into Biscayne Bay



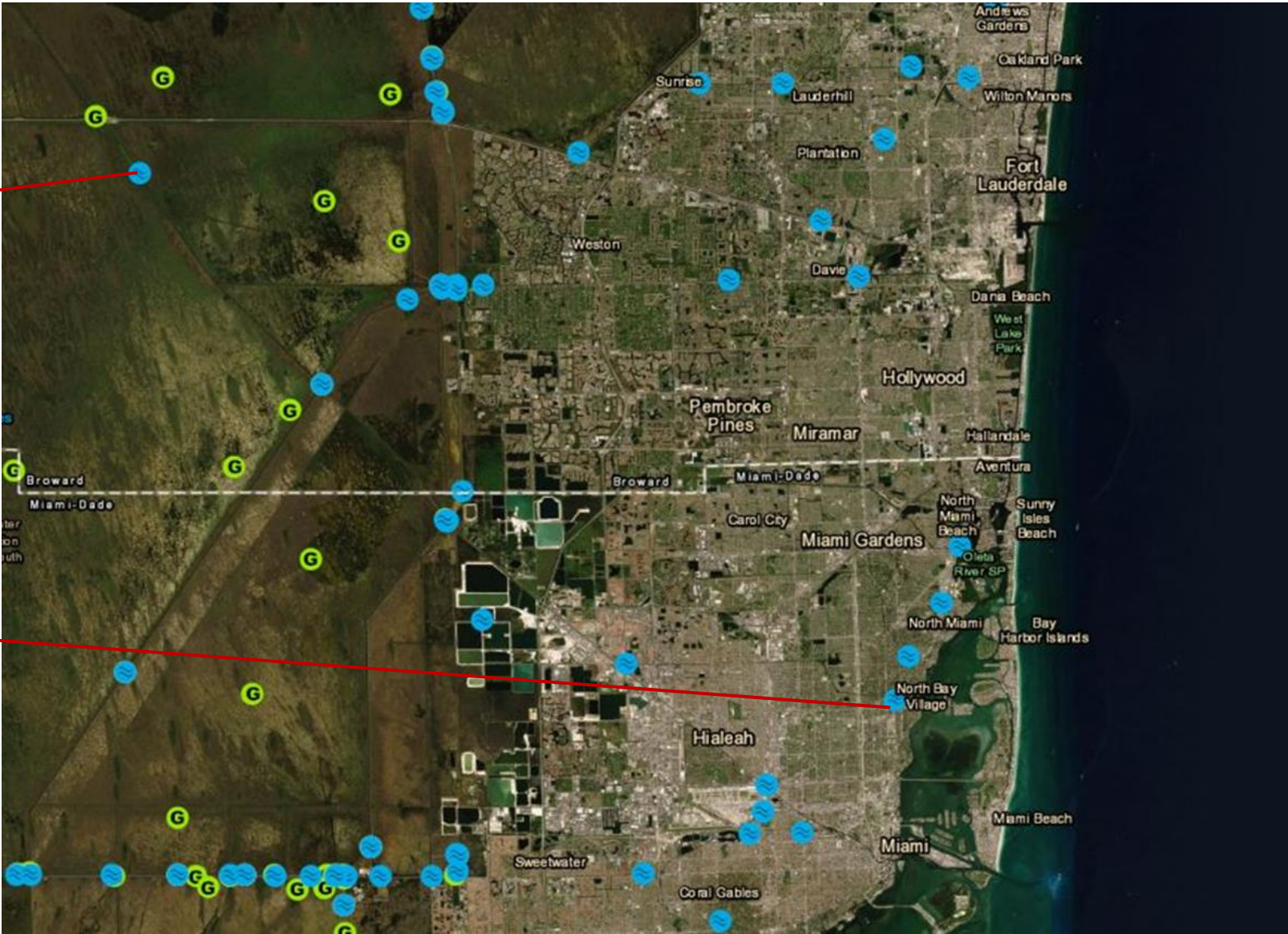
Rivers and Canals that discharge to the Bay



Miami River
Canal S-340

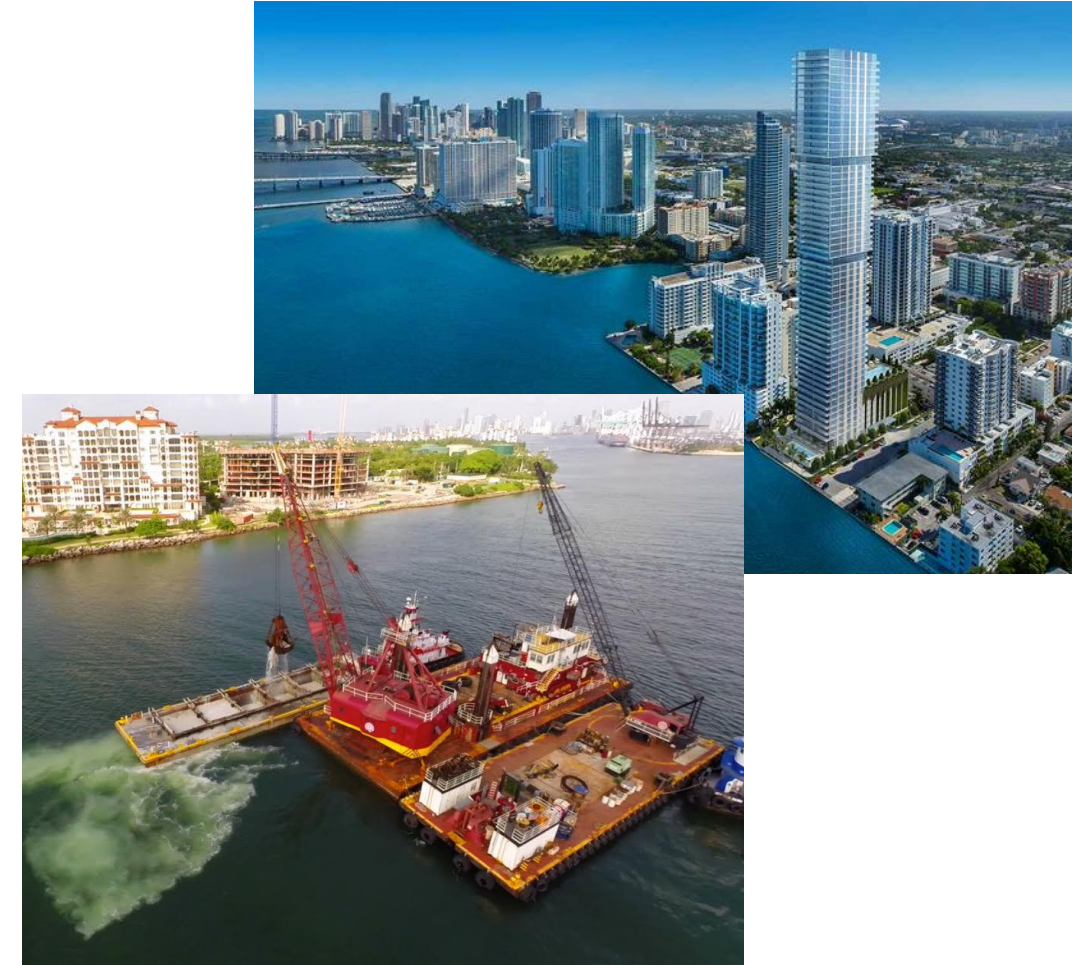
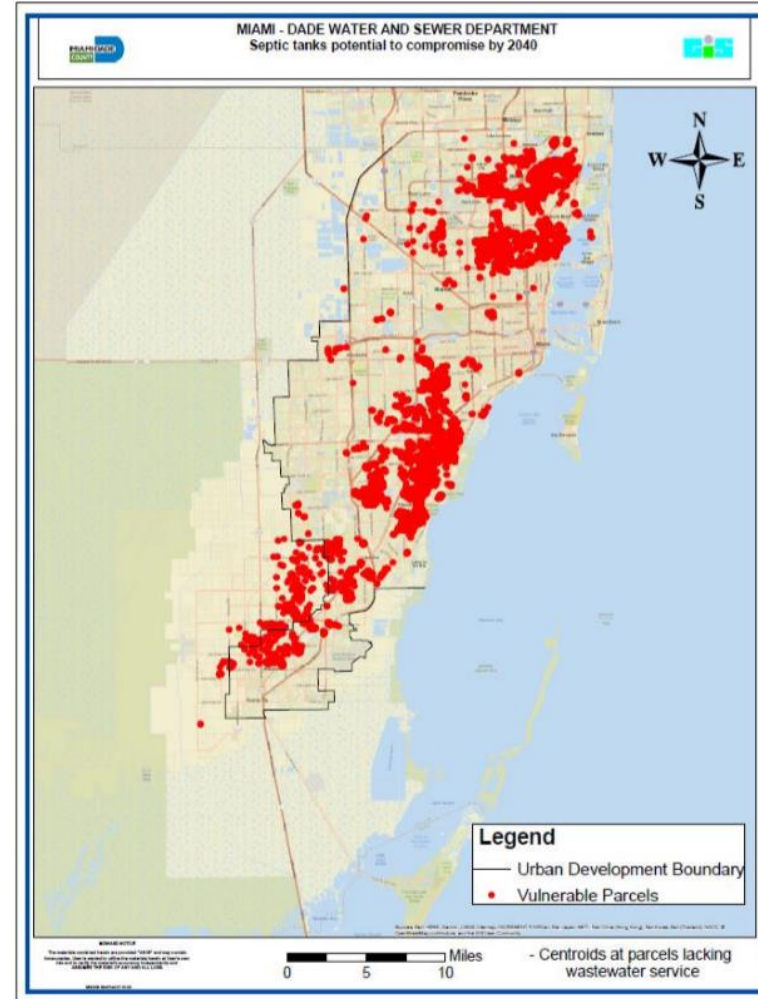


Little River
Canal S-27



Other sources of contaminants

- Accelerated urban re-development
- A more dense urban environment
- Irresponsible discharges
- Sanitary Sewer overflows
- Septic tanks affected by rising groundwater
- Warmer temperatures
- Increased salinity of the water
- Changes in the turbidity
- Construction related activity
- Hurricanes and Tropical Storms





Thank you!

Stormwater Management

Keeping Trash, Pollution and Nutrients out of Biscayne Bay

February 19, 2021 9AM-10:30AM US Eastern Time

biscaynebayfl.com