



SFWMD Sea Level Rise and Flood Resiliency Plan, 2023

David Colangelo, District Resiliency Plan Coordinator

Today's Outline

- 2023 SFWMD Resiliency Plan Overview of Chapters
- Project Implementation Examples
- Questions



Project Team

➤ Carolina Maran	District Resiliency	➤ Jun Han	Hydrology and Hydraulics
➤ David Colangelo	District Resiliency	➤ Ryan Brown	Vegetation Management
➤ Francisco Pena	District Resiliency	➤ LeRoy Rodgers	Vegetation Management
➤ Nicole Cortez	District Resiliency	➤ Fred Sklar	Applied Sciences
➤ Zan Kugler	District Resiliency	➤ Cassondra Armstrong	Applied Sciences
➤ Candida Heater	Budget and Finance	➤ Phyllis Klarmann	Applied Sciences
➤ Julie Maytok	Budget	➤ Matthew Biondolillo	Ecosystem Restoration
➤ Lissette Sori	Budget	➤ Maryam Masheyekhi	GeoSpatial Services
➤ Guianeya Herrera Osorio	Office of Counsel	➤ Christine Carlson	GeoSpatial Services
➤ Lucine Dadrian	Engineering & Construction	➤ Alexandra Hoffart	GeoSpatial Services
➤ Vijay Mishra	Engineering & Construction	➤ Mark Elsner	Water Supply
➤ Sandy Smith	Engineering & Construction	➤ Peter Kwiatkowski	Water Supply
➤ Akintunde Owosina	Hydrology and Hydraulics	➤ Jim Harmon	Water Supply
➤ Hongying Zhao	Hydrology and Hydraulics	➤ Tom Colios	Water Supply
➤ Matahel Ansar	Hydrology and Hydraulics	➤ Bradley Jackson	Big Cypress Basin
➤ Tibebe Dessalegne	Hydrology and Hydraulics	➤ Marcy Zehnder	Real Estate

Public Comments/Contributors

Local Governments / Districts:

- St. Lucie County
- Martin County
- Palm Beach County
- Broward County
- Miami-Dade County
- Monroe County
- Lee County
- Town of Cutler Bay
- Village of El Portal
- City of Port St. Lucie
- Lake Worth Drainage District
- Florida Keys Aqueduct Authority
- Florida Dept. of Transportation
- U.S. Fish and Wildlife Service

NGOs:

- Miami Waterkeeper
- Sanibel-Captiva Conservation Foundation
- Growing Climate Solutions
- National Parks Conservation Association
- Urban Paradise Guild
- Audubon of Florida
- Florida Veterans for Common Sense
- Center for Biological Diversity
- South Florida Water Coalition
- Family Lands Remembered
- Everglades Foundation
- Friends of Biscayne Bay
- Central Florida Regional Planning Council

Private Companies:

- 300 Engineering Group
- Conservation Concepts LLC

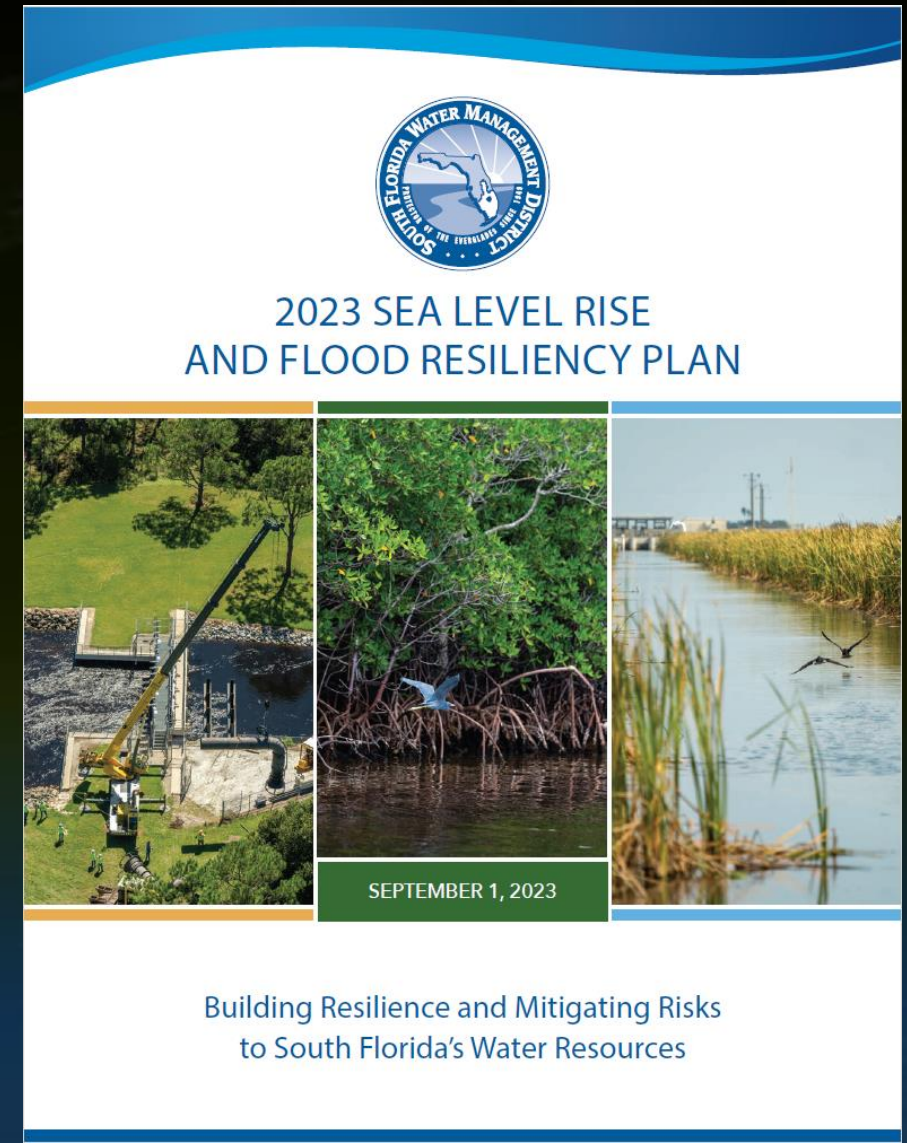
Universities:

- University of Miami
- Florida International University

Other individuals

2023 Resiliency Plan Chapters

- Chapter 1. Our Resiliency Vision
- Chapter 2. Central and Southern Florida System and Big Cypress Basin
- Chapter 3. Flood Protection Level of Service Program
- Chapter 4. Nature-Based Solutions
- Chapter 5. Ecosystem Restoration Resiliency & Carbon Storage
- Chapter 6. Water Supply Resiliency
- Chapter 7. Energy Efficiency and Renewable Energy
- Chapter 8. Characterizing and Ranking Resiliency Projects
- Chapter 9. Priority Implementation Projects
- Chapter 10. Priority Planning Studies



Chapter 1 – Our Resiliency Vision

➤ Risk Reduction

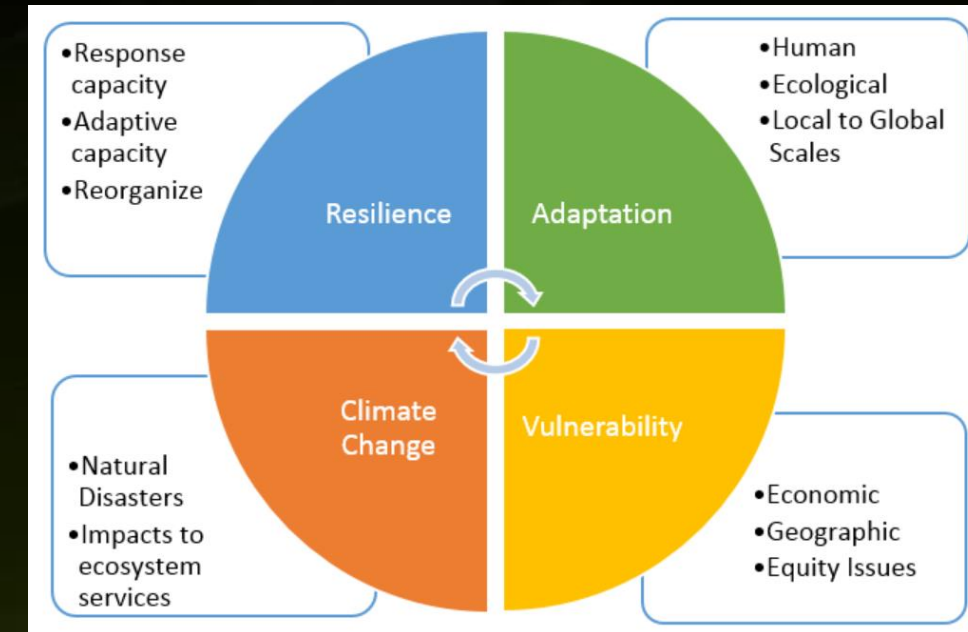
- Reduce risk while maximizing effectiveness

➤ Implementation Resources

- Project planning and management

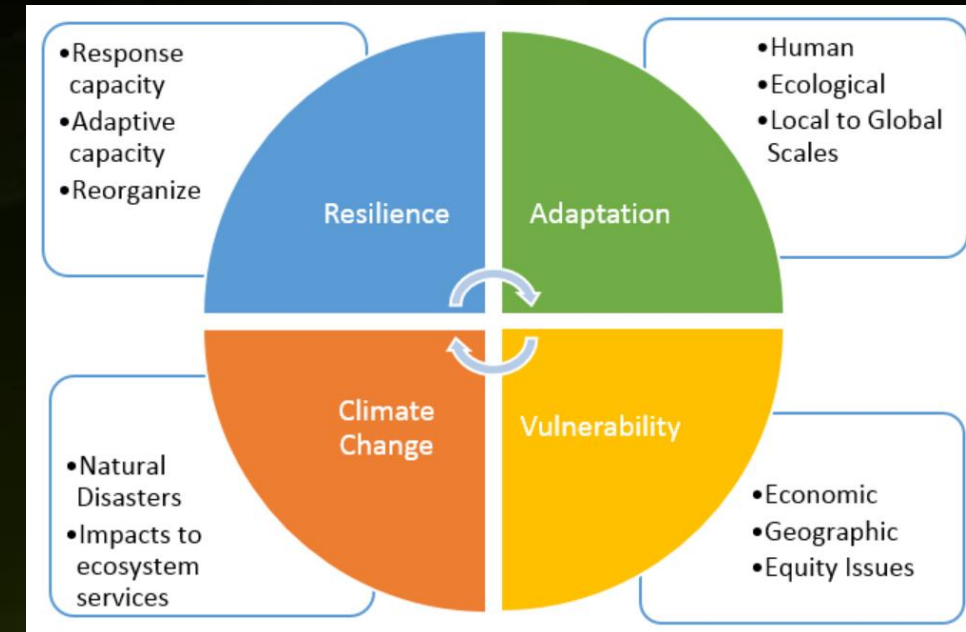
➤ Future Conditions

- Population and land development
- Climate and sea level rise considerations



Chapter 1 – Our Resiliency Vision

- Vulnerable Population and Critical Infrastructure
 - Ensure community-wide benefits
 - Protection of community lifelines
- Leveraging Partnerships and Public Engagement
 - Resiliency Forum
 - Outreach activities
- Ecosystem Restoration/Carbon Storage



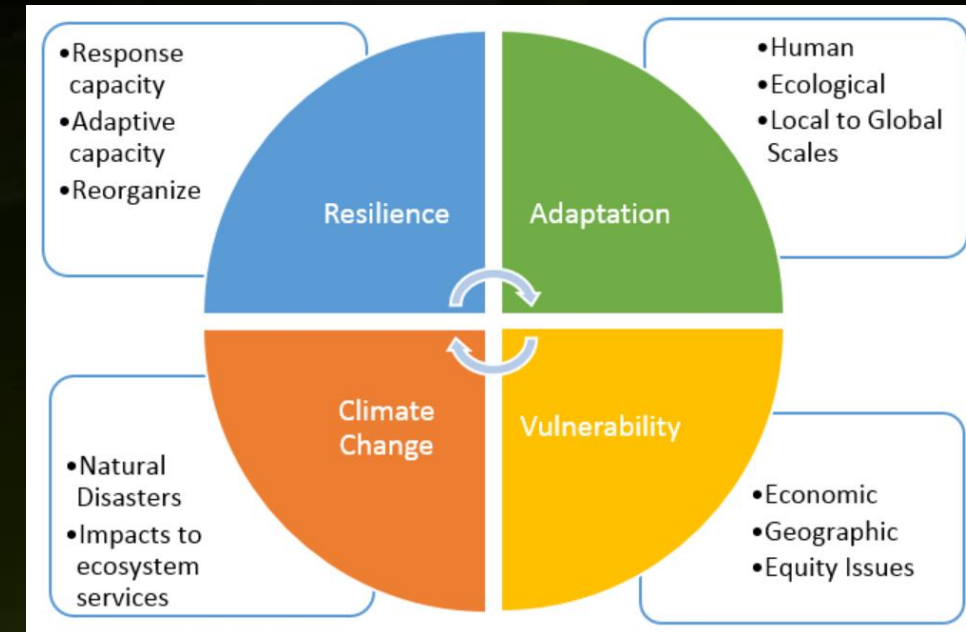
Chapter 1 – Our Resiliency Vision

➤ Nature-Based Solutions

- Incorporate NBS into Gray (traditional) Infrastructure projects

➤ Energy Efficiency/Renewable Energy

- Follow latest building codes
- Energy efficient designs
- Offset new energy demands with renewable energy solutions



Chapter 2 – C&SF and BCB Systems

➤ Current Challenges and Limitations

- Population growth
- Land development
- Extreme rainfall events
- Sea level rise

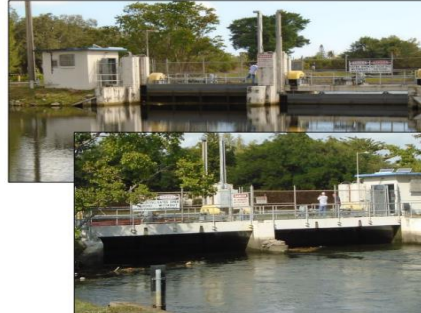
➤ Capital Improvement Plan

- Building resiliency into projects
- CIP feeds into FPLOS

FY20 SIP S28

Structure Inspection Program

S28
SPILLWAY
MIAMI Field Station
South C&SF
C-8
of Gates: 2
Lifting/Pumping Mechanism: Cable Drum, Description: Roller



Inspection Summary/Issue Identification

FY20 Update to FY15019 – (Updated 1-31-20)

S-20F Major Half-Life Refurbishment		Date: 1-31-2020
Structure Type: Spillway	Field Station / Contact: Homestead / Sean Smith	Priority Score: 17.02 Priority Level: 2

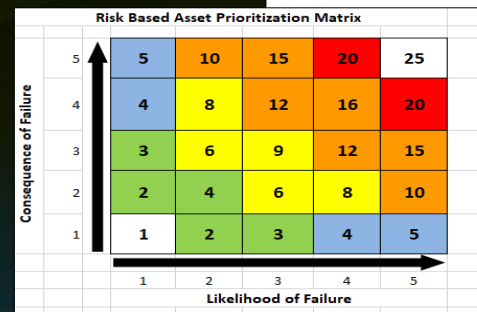
Inspector Information

Lead Inspector: Tim Kunard	Inspection Date: 1-6-20	Phone: 561-882-6305
Previous Inspection Date: 2-12-15	Previous Inspector: Gary Dunmyer	
F/S Supervisor: Sean Smith	F/S Bureau Chief: Jesus Carrasco	
Signature: <i>[Signature]</i>	Signature: <i>[Signature]</i>	

Structure Details

Description: Spillway	# Gates: 3	# Pumps: 0	# Barrels: 0	Lifting Mechanism: Hydraulic
-----------------------	------------	------------	--------------	------------------------------

Figure 1 – Aerial Image of the S20F Structure site



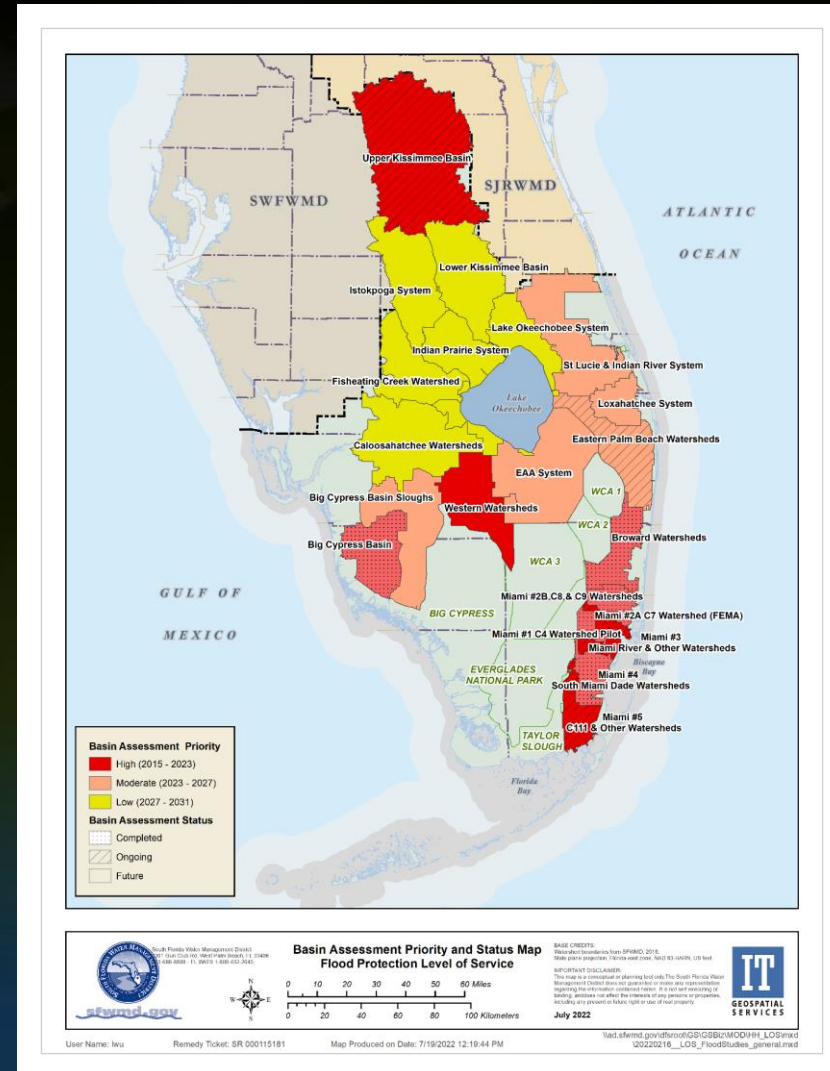
- Identify basin-wide flood vulnerabilities

- Identify solutions to vulnerabilities

- Design, permitting, real estate, construction

- Estimate flood damage costs

- Calculate benefit cost analysis



Chapter 4 – Nature Based Solutions

➤ Nature-Based Solutions – Reduce Flood Risk

- Reconnecting Floodplains
- Wetland Restoration
- Innovative Stormwater Storage
- Living Shorelines
- Bioswales

➤ Integrate into Gray Infrastructure

➤ Collect, Store and Slow the Flow

➤ Project Recommendations in Chapter 9



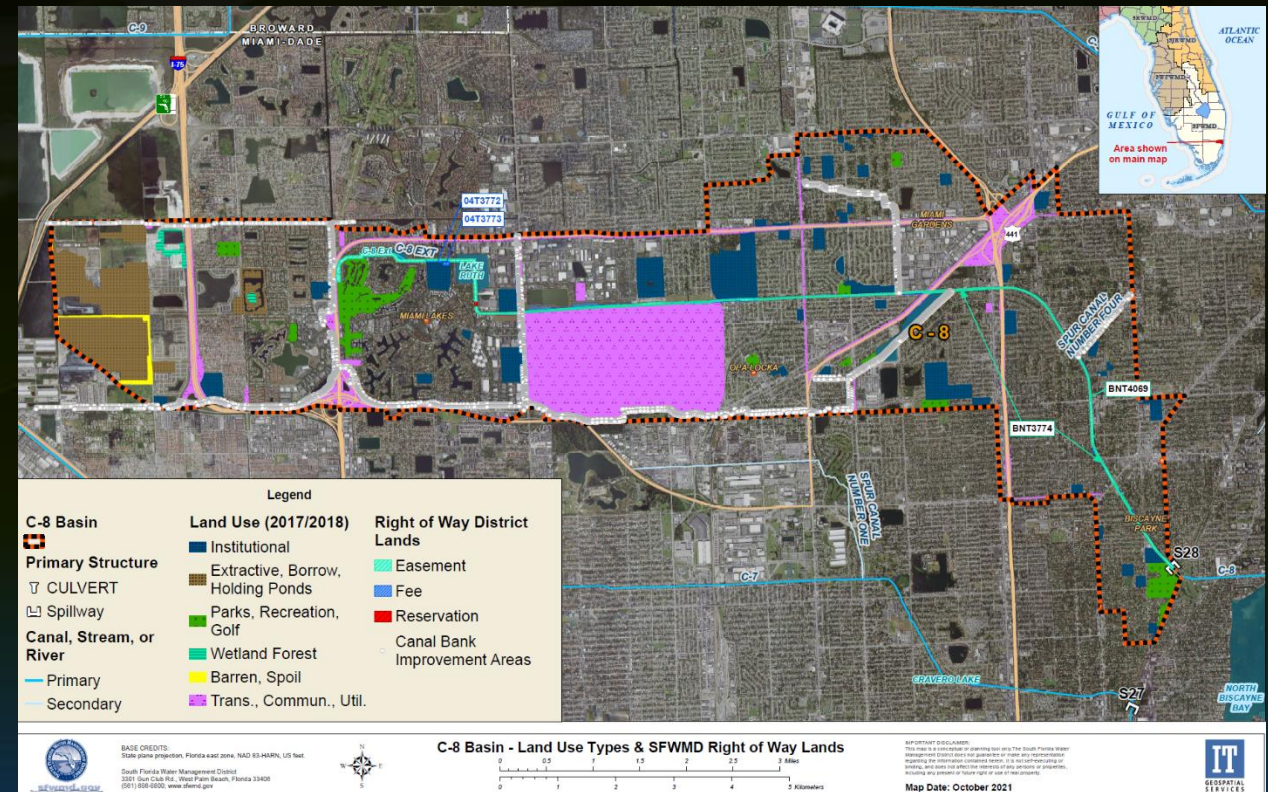
Chapter 4 – Nature Based Solutions

➤ Process for Assessing and Implementing NBS

- Identify Opportunities (available land)
- Select and assess NBS
- Design NBS implementation processes
- Engage stakeholders, communicate co-benefits and establish partnerships
- Implement NBS, upon funding
- Monitor and evaluate co-benefits
- Transfer and upscale NBS

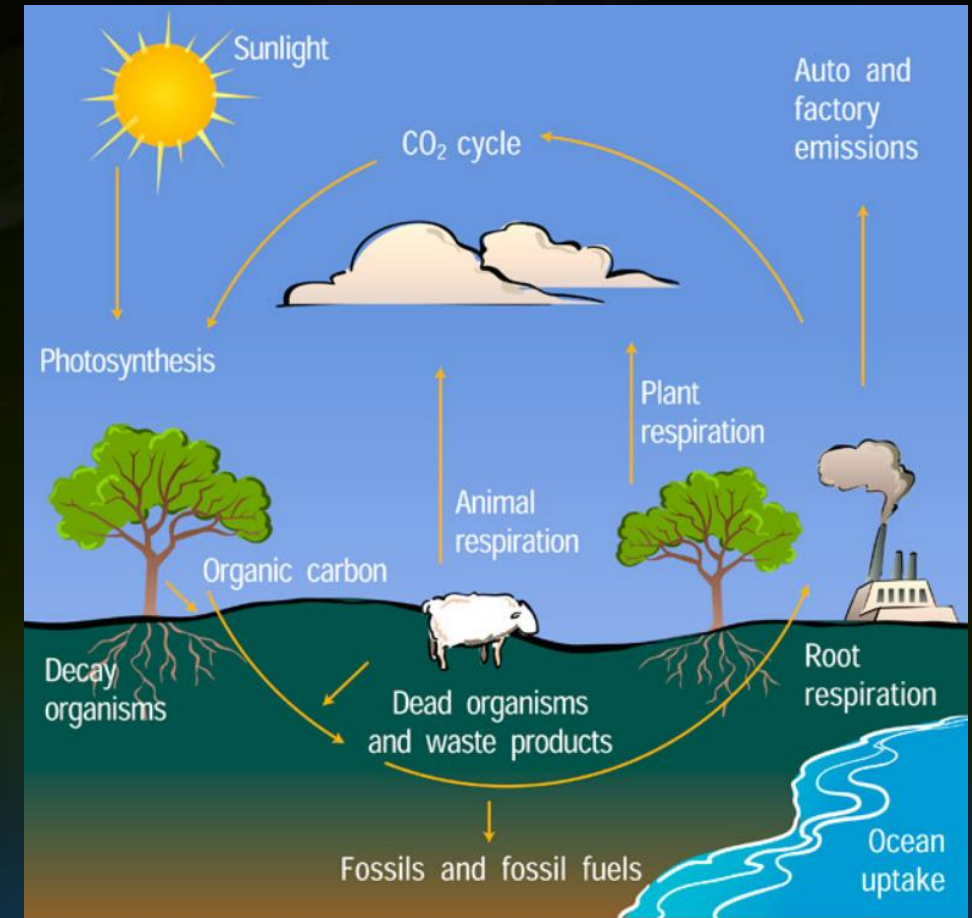
➤ Process for Evaluating NBS

- Performance Metrics



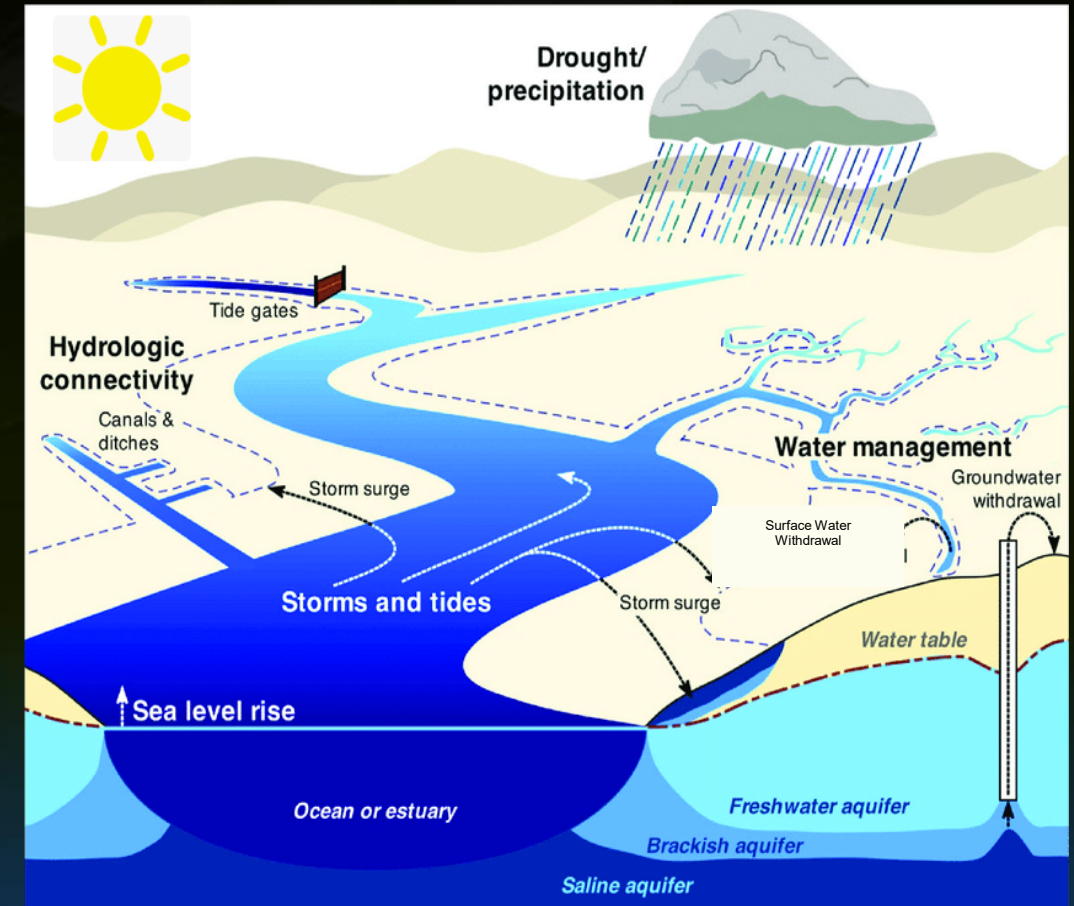
Chapter 5 – Ecosystem Restoration and Carbon Storage

- Ecosystem Restoration Projects Increase Resiliency
- Restoration projects have the potential to uptake carbon
 - CERP Projects
 - Stormwater Treatment Areas
 - Water Conservation Areas
 - Other District Lands
- Project Recommendation – Carbon Storage Monitoring
 - Soil accretion
 - Carbon flux towers



Chapter 6 – Water Supply Resiliency

- Understanding and assessing vulnerabilities to future conditions
 - **Water Supply Vulnerability Assessment**
- Building upon existing water supply plans
 - Protect existing water supply sources
 - Develop alternative water sources
- Assessing long term scenarios



Chapter 7 – Energy Efficiency and Renewable Energy

- Seeking to increase energy efficiency and offset existing and **new energy demands**
- Florida building code energy efficiency requirements
- Solar energy project recommendations
 - Solar arrays on lands adjacent to C-43 and C-44 reservoirs
 - Large up to 75 megawatt solar farms on District lands or
 - Smaller up to 5 megawatt arrays to power District facilities
 - Solar canopy in HQ parking lot and other facilities
 - Floating solar panels pilot project on Lake Freddy



Chapter 8 – Characterizing and Ranking Resiliency Projects

Ranking Criteria – Four Tiers

1. Likelihood of System Deficiency (40%)
2. Consequence of System Deficiency (30%)
3. Project Benefits and System Enhancement (20%)
4. Structure Inspection Program Rating and Capital Improvement Program Status (10%)

				Low Probability				High Probability
Criteria	ID	Category	Weighting	1	2	3	4	5
Consequence of System Deficiency	2.1	Critical Assets / Lifelines	6%			0-25% of Critical Assets are within areas lower than 6FT or within inundated areas from FPLOS	25-50% of Critical Assets are within areas lower than 6FT or within inundated areas from FPLOS	More than 50% of Critical Assets are within areas lower than 6FT or within inundated areas from FPLOS
			6%			1 or more RS Critical Assets	3 or more RS Critical Assets	5 or more RS Critical Assets
	2.2	Impact Area Across Administrative Boundaries	2.5%	1 County		1 County & 2 Administrative Boundaries		> 2 Counties & > 2 Administrative Boundaries
	2.3	Social Vulnerability (CDC SVI)	5.0%				0.4 - 0.6	> 0.6
		Social Vulnerability (CEQ CEJST)						Yes
	2.4	Environmental Protected Areas	3.5%	Lower Density		Average		Higher Density
	2.5	Total Population	1%	Up to 50,000 people	Up to 100,000 people	Up to 200,000 people	Up to 500,000 people	More than 500,000 people
	2.6	Public Water Supply Wellfields	5%	Lower Density		Average		Higher Density
2.7	Adaptation Action Areas	1%	Does not Intersect Adaptation Action Area				Intersect Adaptation Action Area	

Chapter 9 – Priority Implementation Projects

➤ 23 Projects at Coastal Water Control Structures

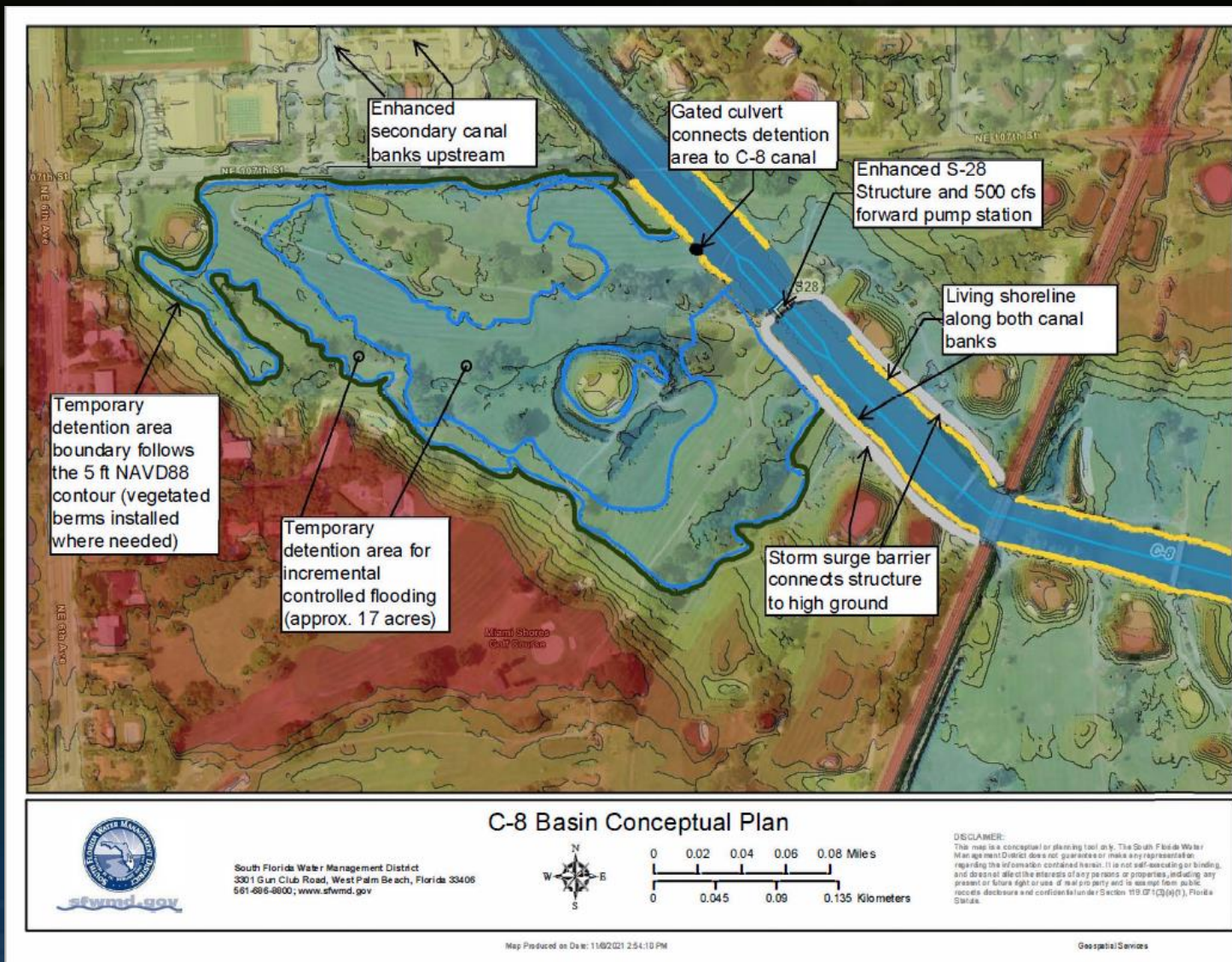
- Enhance and adapt structures to restore original level of service
- Implement additional regional strategies (including basinwide storage, flood barriers/levees, conveyance and nature-based features)

➤ 15 Other Resiliency Related Projects

- Enhance and adapt inland water control structures and levees
- Restore more natural hydroperiods
- Improve communications/automation for flood control
- Build coastal resilience with nature-based projects
- Renewable energy projects

Project Implementation: C-8 Basin Resiliency – FEMA BRIC Grant Recommended Award

- Replace S-28 Structure and construct flood barrier
- Install Forward Pump Station
- Enhance secondary canal banks
- Construct temporary floodwater detention area
- install living shoreline



C-7 Basin Resiliency – FEMA BRIC Grant Recommended Award

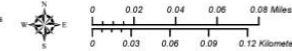
- Enhance S-27 Structure and construct storm surge barrier
- Install Forward Pump Station
- Install living shoreline and wetland restoration/stormwater detention area
- Build canoe/kayak launch area
- Install park amenities with shaded area for educational/recreational use



W.H. Turner High School - Nature-Based Features



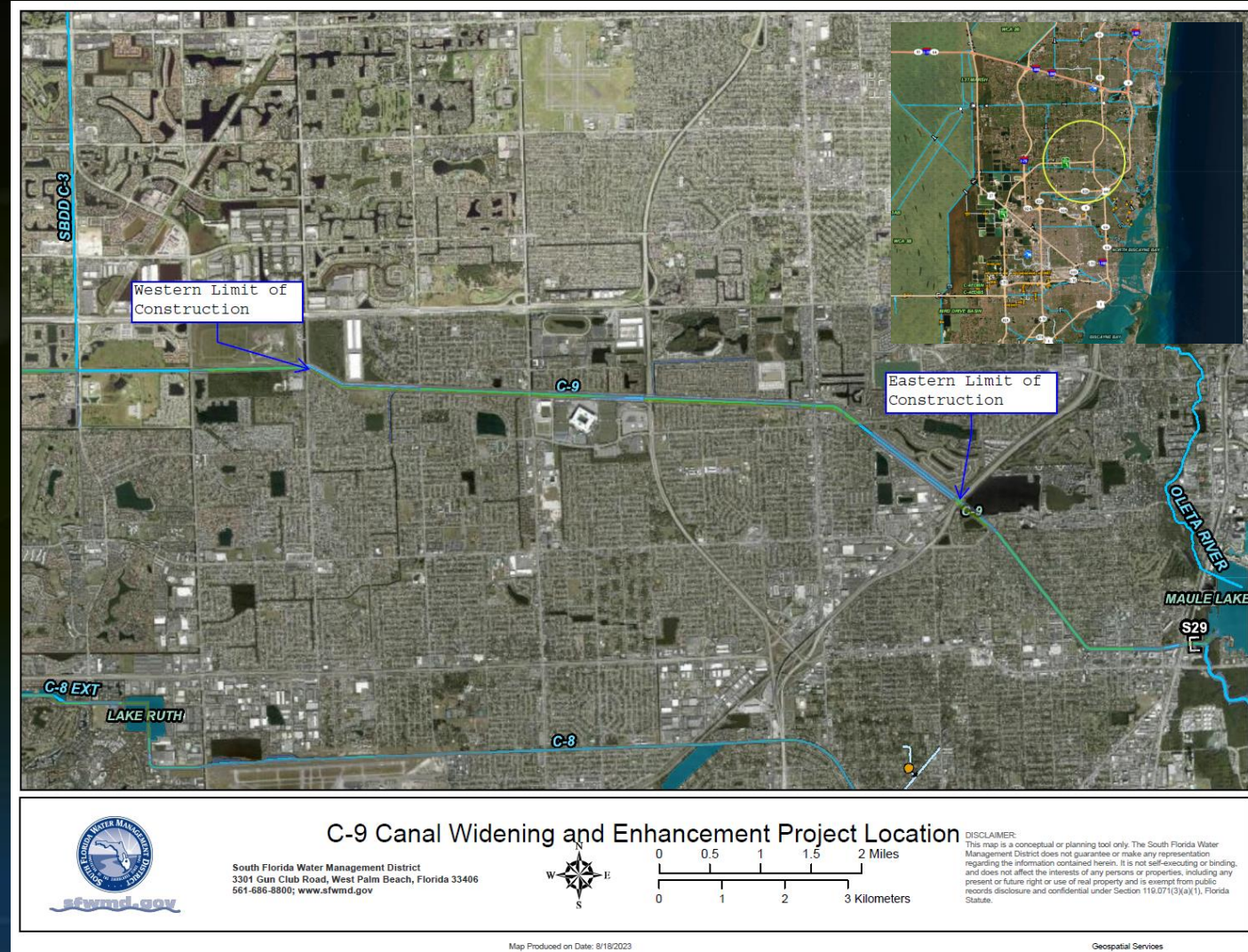
South Florida Water Management District
3301 Gue Club Road, West Palm Beach, Florida 33416
561-486-8888; www.sfwmd.gov



DISCLAIMER:
This map is a conceptual or planning tool only that was created using a South Florida Water Management District (SFWMD) publicly accessible data application, which allows any user to add information, graphics, and other drawings. The accuracy of which has not been verified by the SFWMD. The South Florida Water Management District does not guarantee or make any representation regarding the information contained herein. It is not self-sufficient or binding, and does not affect the interests of any persons or properties, including any present or future right or use of real property and is exempt from public records disclosure and confidential under Section 119.07(1)(b), Florida Statute.

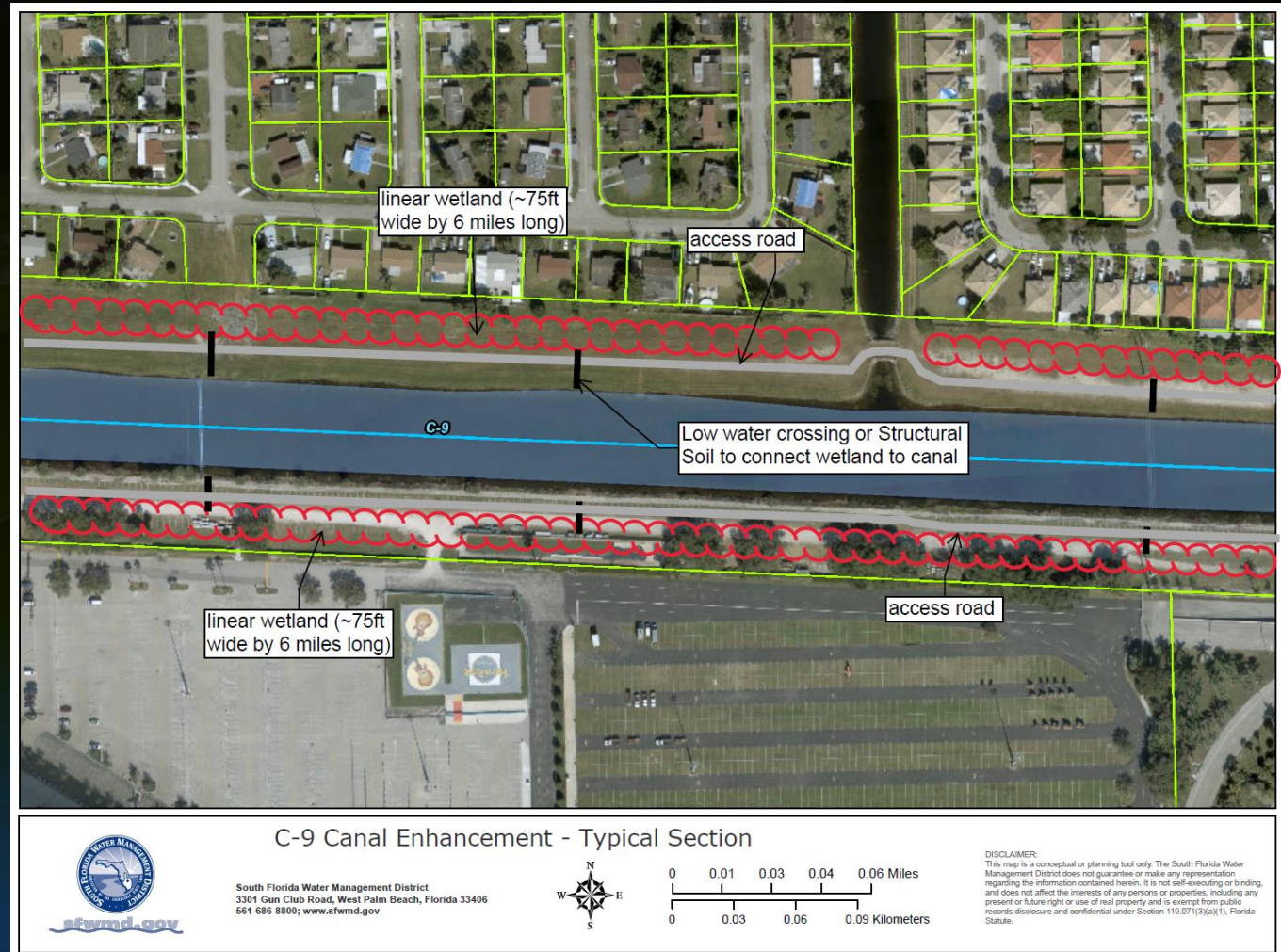
C-9 Canal Enhancement Project – FEMA BRIC Grant Application

- FPLOS study results show a need for enhanced conveyance and storage capacity in the basin
- Forward pumps alone are not enough to achieve desired level of service
- Project footprint along six-mile section of C-9 Canal
- Chosen based upon available District owned ROW



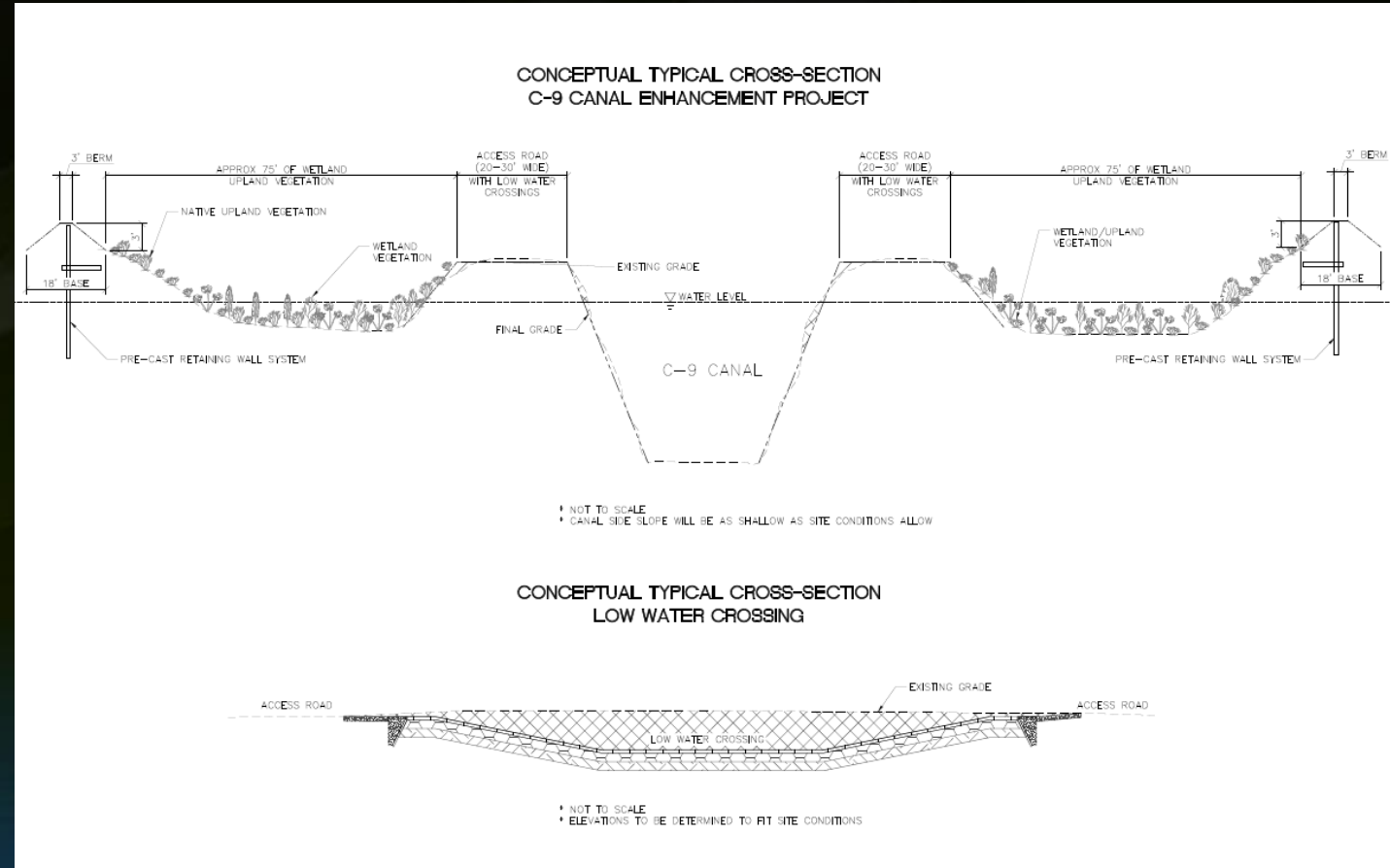
Proposed Canal Enhancement Features and Benefits

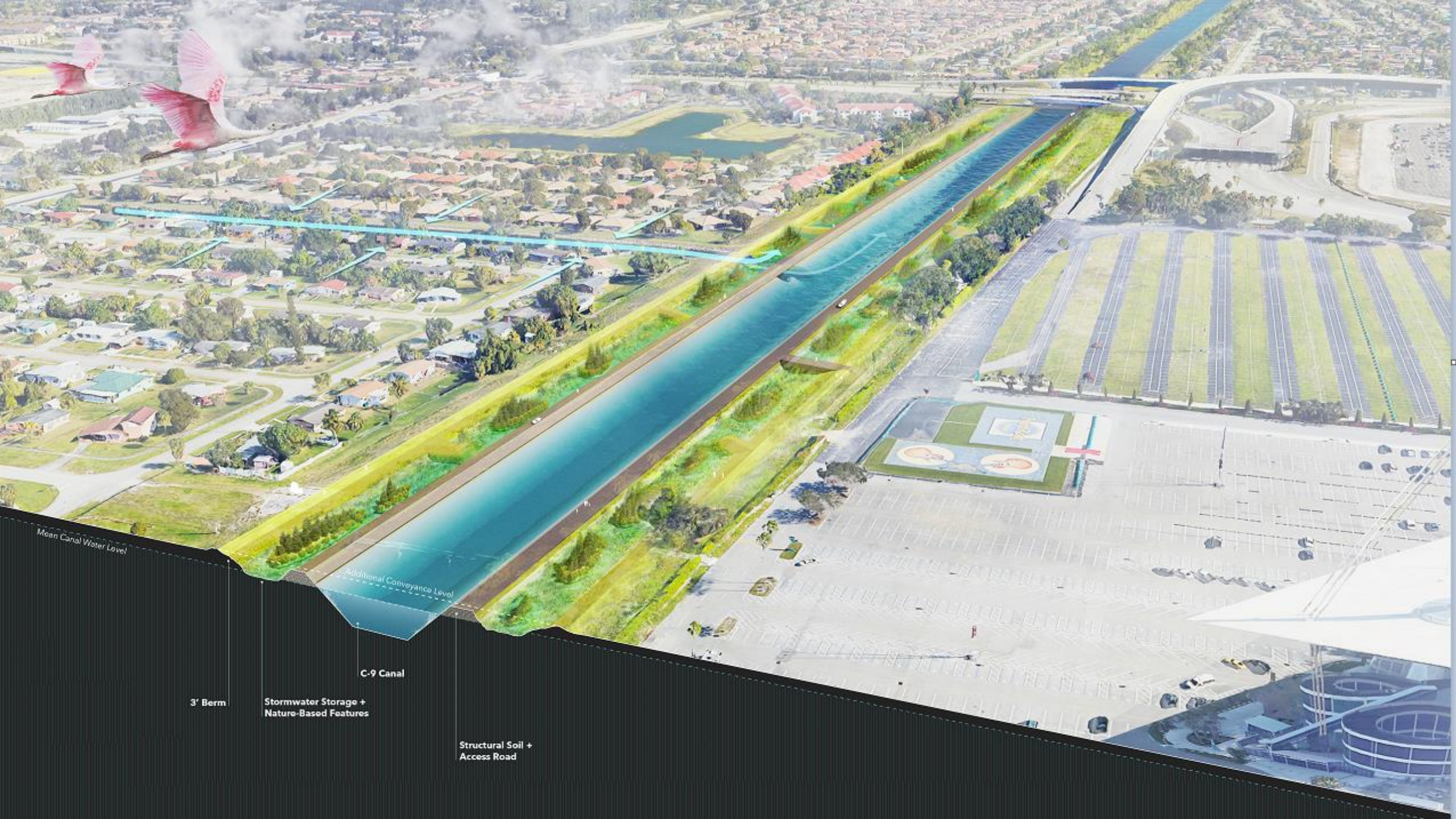
- Berms for Stormwater Storage on ROW floodplain
 - Enhance conveyance and storage
 - Improve flood protection level of service
- Construct wetland adjacent to canal
 - Create additional stormwater storage
 - Restore floodplain connectivity
 - Increased evapotranspiration in wetland can contribute to reduction in peak stage and flood duration
 - Enhance water quality
 - Improve fish and wildlife habitat



Proposed Canal Enhancement Features and Benefits

- Construct berms and access roads along canal banks
 - Improve access for operation and maintenance
 - Potential for increased public access for recreation
- Construct low water crossings along access road to connect wetland with canal
- Construct structural and/or nature-based features at secondary canals outfalls of to improve water quality





Mean Canal Water Level

Additional Conveyance Level

C-9 Canal

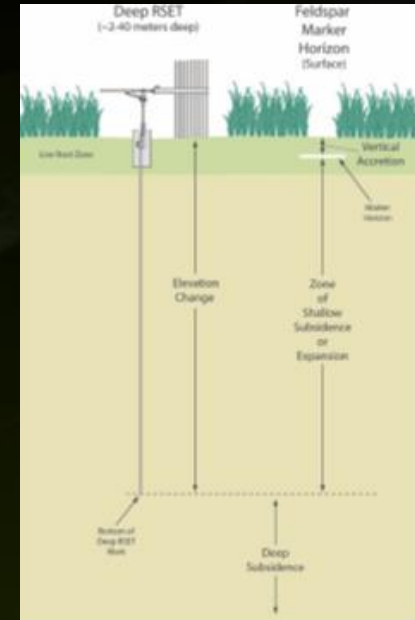
3' Berm

Stormwater Storage +
Nature-Based Features

Structural Soil +
Access Road

Everglades Mangrove Migration Assessment

- Demonstration-scale pilot study: address Everglades vulnerabilities to SLR
- Nature-based solution to increase coastal mangrove elevation and reduce saltwater intrusion, peat collapse and land loss
- Increase adaptive capacity of Florida's coastal wetlands to keep up with SLR and provide flood protection to upland areas
 - Preserve, enhance and restore mangroves
 - Build coastal resilience by reduce storm surge damage
 - Create/enhance wildlife habitat
- Results are transferable to areas throughout the Gulf and Atlantic Coasts of Florida



Post Hurricane Ian Projects

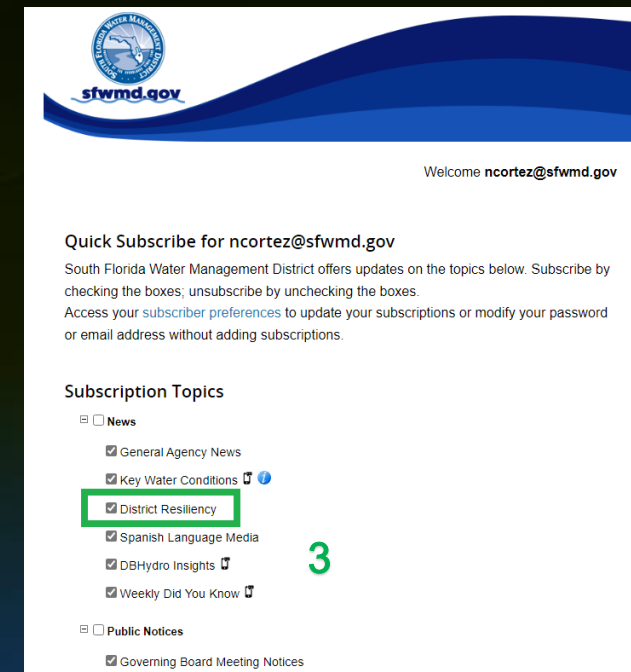
1. C-29, C-29A, C-29B, C-29C Canal Conveyance Improvements
2. S-59 Structure Enhancement and C31 Canal Conveyance Improvements
3. S-58 Structure Enhancement and Temporary Pump
4. S-61 Spillway Enhancement and Erosion control
5. Big Cypress Basin Microwave Tower
6. Corbett Levee Water Control Structures
7. Upper Kissimmee Basin Flood Study, Adaptation Planning and Project Recommendations (Planning)

Chapter 10 – Priority Planning Studies

- FPLOS Phase I Assessments
- FPLOS Phase II
- Water Supply Vulnerability Assessment
- Water and Climate Resiliency Metrics
- Hydrometeorological Data Monitoring
- Statewide Climate Projections
- Enhancing Tidal Predictions
- Flooding Observations Survey and Notification
- Evaluating Performance of SFINCS
- Green Infrastructure Flood Mitigation
- Waterways Impact Protection Effort (Funded via FDEP Innovative Tech Grant)
- Future Conditions District Internal Guidance for Regulation
- Carbon Storage Monitoring
- Designing Wetland Habitat Enhancement and Flooding Improvements for Charlotte Harbor Flatwoods

Subscribe for District Resiliency Updates

- Sign-up for our updates by visiting <https://www.sfwmd.gov/news-events> and following these steps:
 - 1 - Click on the “Subscribe for Email” icon
 - 2 - Enter your email address
 - 3 - Select “District Resiliency” under Subscription Topics



2

3

Thanks!

Questions?

Comments?

www.sfwmd.gov/resiliency

Photo by Miami DDA