# 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

| | |
|---|---|
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| David Colangelo | District Resiliency |
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| Julie Maytok | Budget |
| Lissette Sori | Budget |
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| Vijay Mishra | Engineering & Construction |
| Sandy Smith | Engineering & Construction |
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| Matahel Ansar | Hydrology and Hydraulics |
| Tibebe Dessalegne | Hydrology and Hydraulics |
| Jun Han | Hydrology and Hydraulics |
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| Cassondra Armstrong | Applied Sciences |
| Phyllis Klarmann | Applied Sciences |
| Matthew Biondolillo | Ecosystem Restoration |
| Maryam Masheyekhi | GeoSpatial Services |
| Christine Carlson | GeoSpatial Services |
| Alexandra Hoffart | GeoSpatial Services |
| Mark Elsner | Water Supply |
| Peter Kwiatkowski | Water Supply |
| Jim Harmon | Water Supply |
| Tom Colios | Water Supply |
| Bradley Jackson | Big Cypress Basin |
| 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 Remebered
- Everglades Foundation
- Friends of Biscayne Bay
- Central Florida Regional Planning Council

## Private Companies:

- 300 Engineering Group
- Conservation Concepts LLC

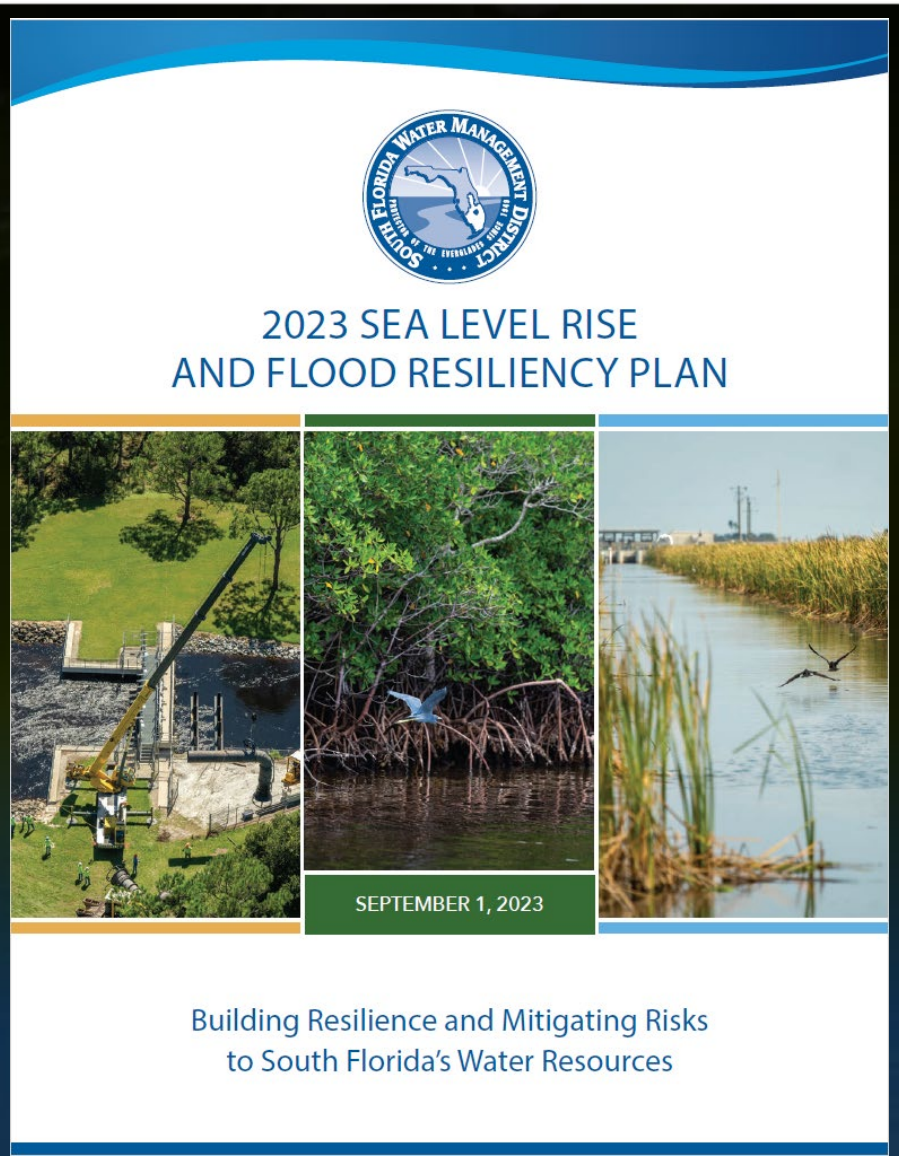
## Universities:

- University of Miami
- Florida International University

## Other individuals

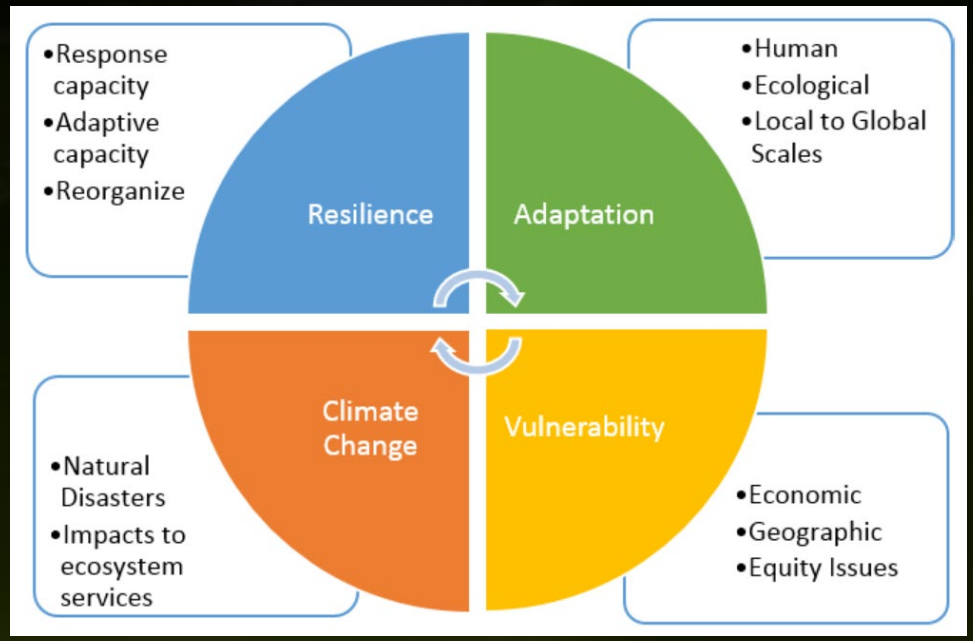
# 2023 Resiliency Plan Chapters

- 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



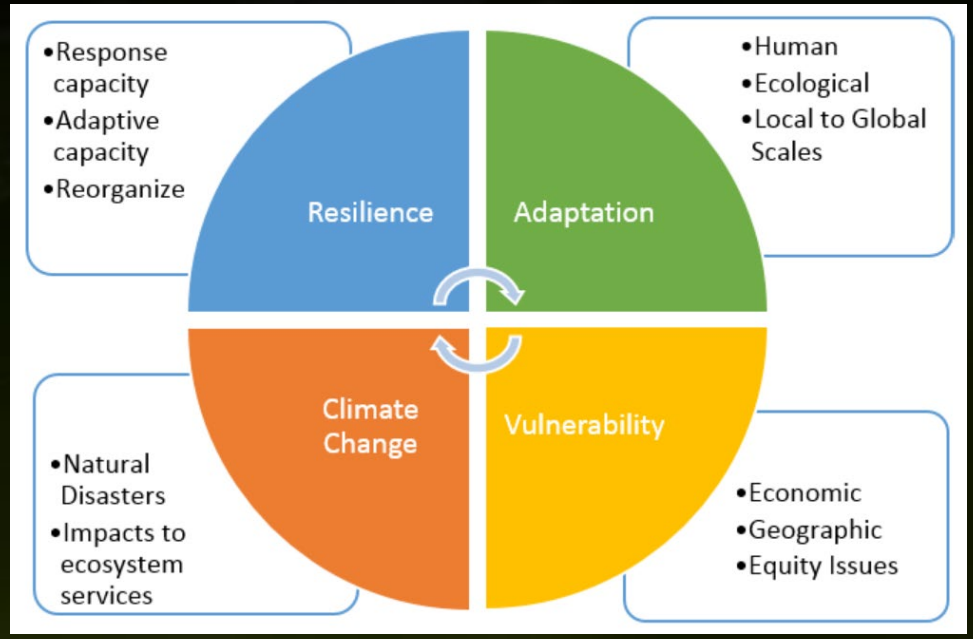
# Chapter 1 – Our Resiliency Vision

- 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



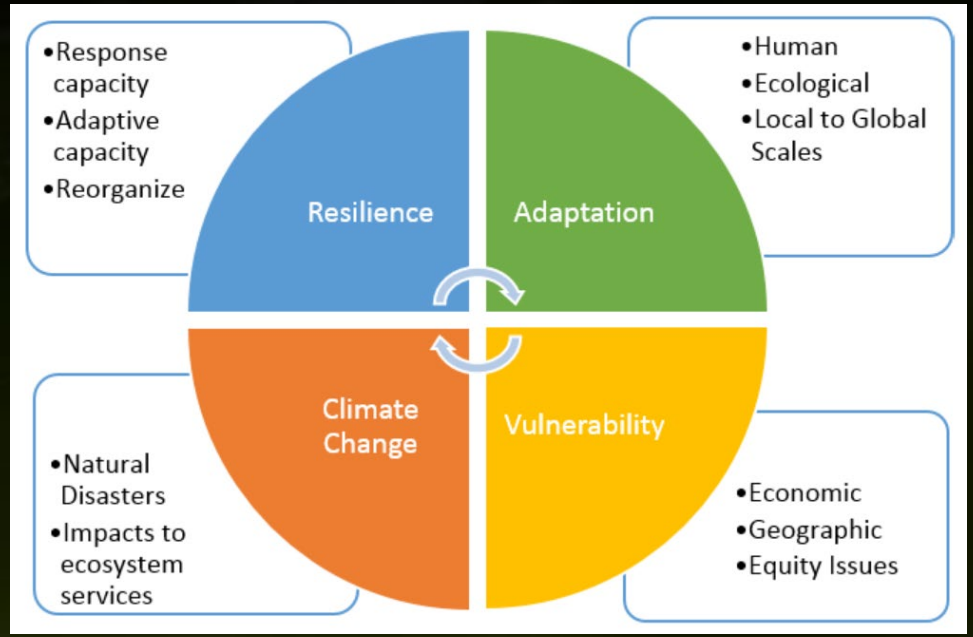
# Chapter 1 – Our Resiliency Vision

- 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



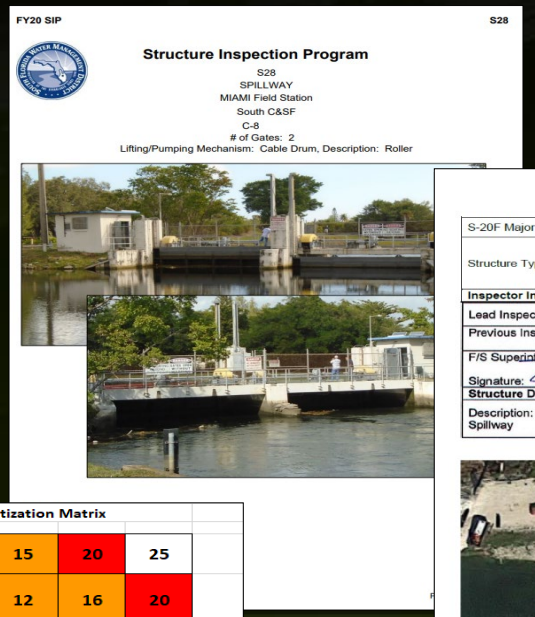
# Chapter 1 – Our Resiliency Vision

- 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



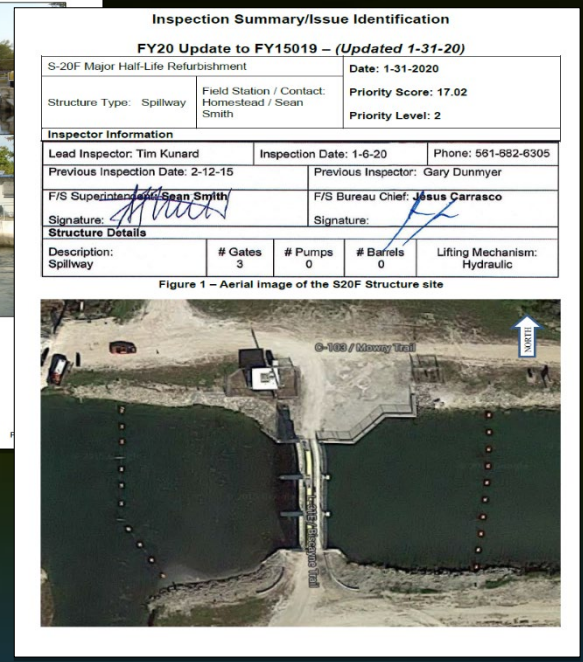
# Chapter 2 – C&SF and BCB Systems

- 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<br>Priority Level: 2 |

Inspector Information

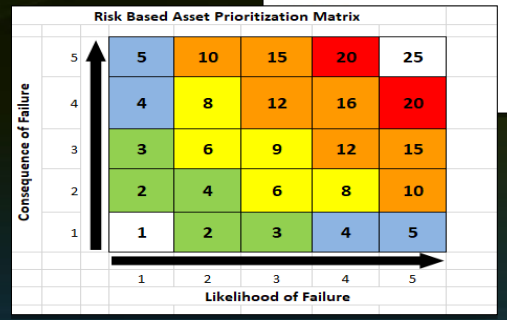
| | | |
|---|---|---|
| Lead Inspector: Tim Kunard | Inspection Date: 1-6-20 | Phone: 561-682-6305 |
| Previous Inspection Date: 2-12-15 | Previous Inspector: Gary Dunmyer | |
| F/S Superintendent: Sean Smith<br>Signature: | F/S Bureau Chief: Jesus Carrasco<br>Signature: | |

Structure Details

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

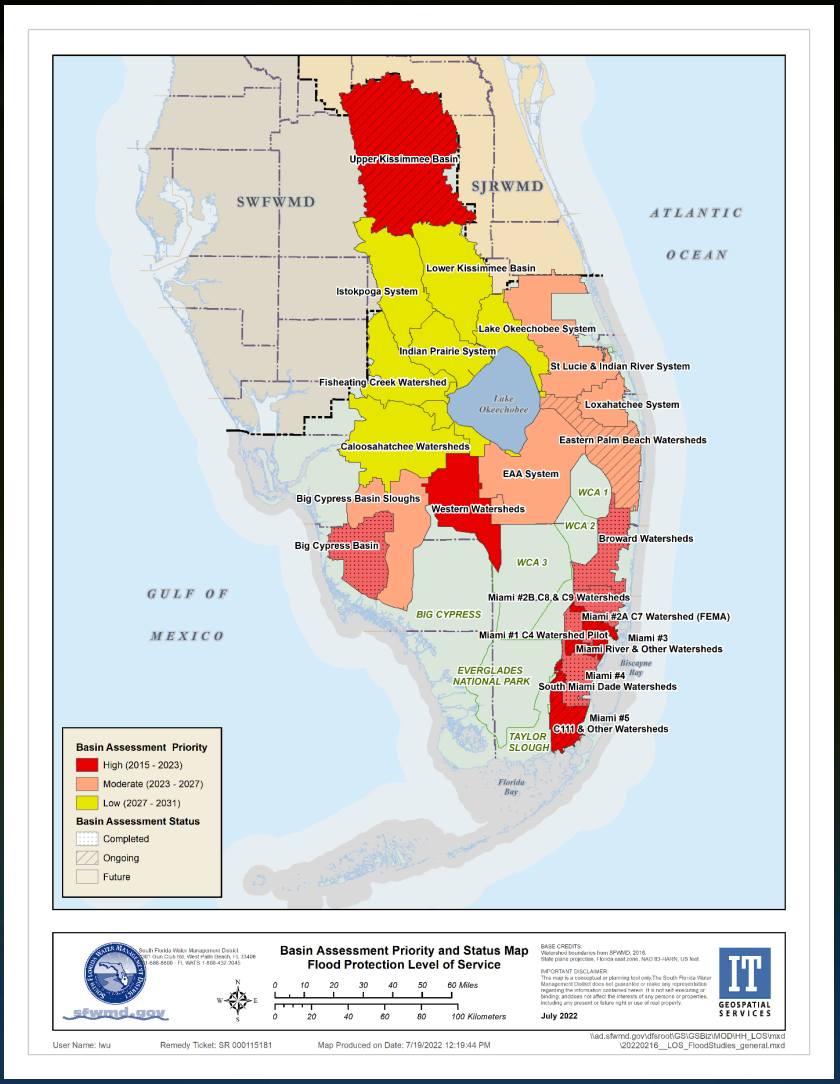
Figure 1 – Aerial image of the S20F Structure site



# Chapter 3 – Flood Protection Level of Service

- Phase I – Flood Vulnerability Assessments
  - Identify basin-wide flood vulnerabilities
- Phase II – Adaptation and Mitigation Planning
  - Identify solutions to vulnerabilities
- Phase III – Implementation (Through this Plan)
  - Design, permitting, real estate, construction
- Flood Impact Assessment Tool (SFWMD-FIAT)
  - Estimate flood damage costs
  - Calculate benefit cost analysis

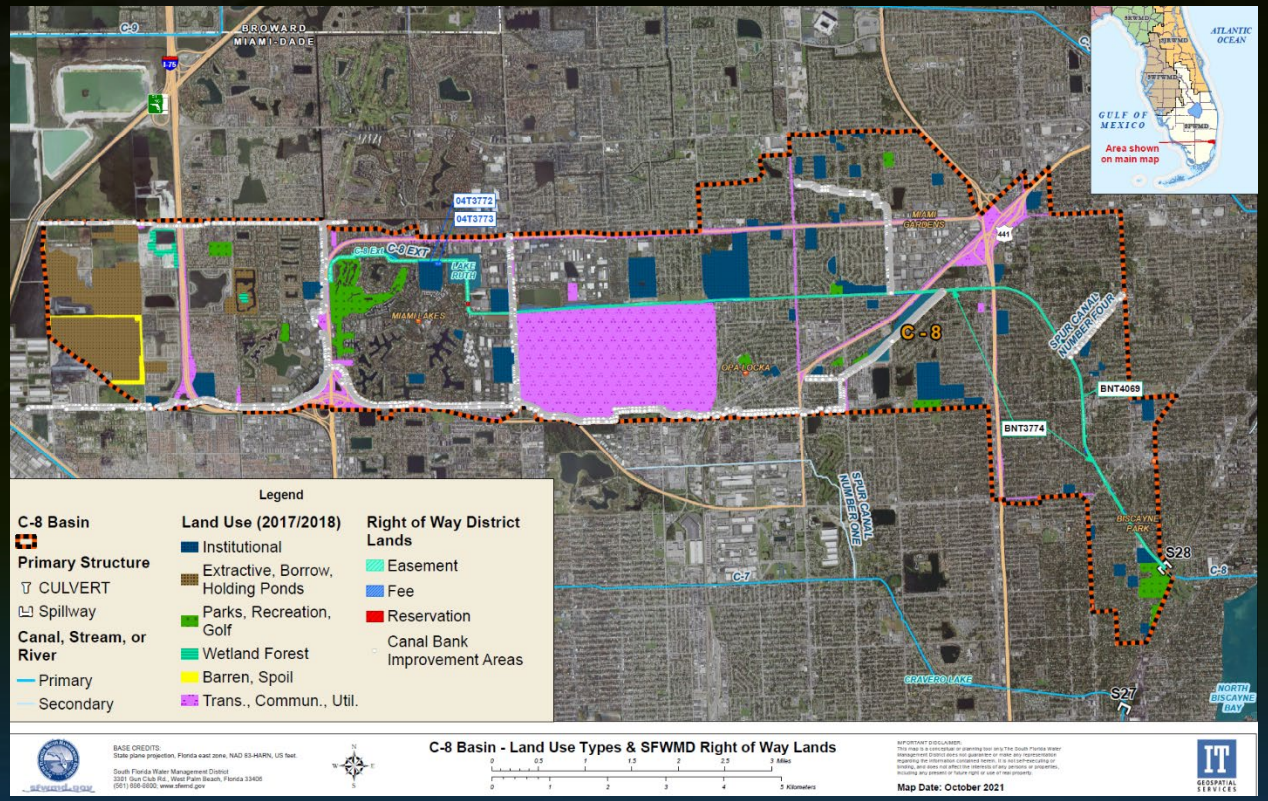


# Chapter 4 – Nature Based Solutions

- 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

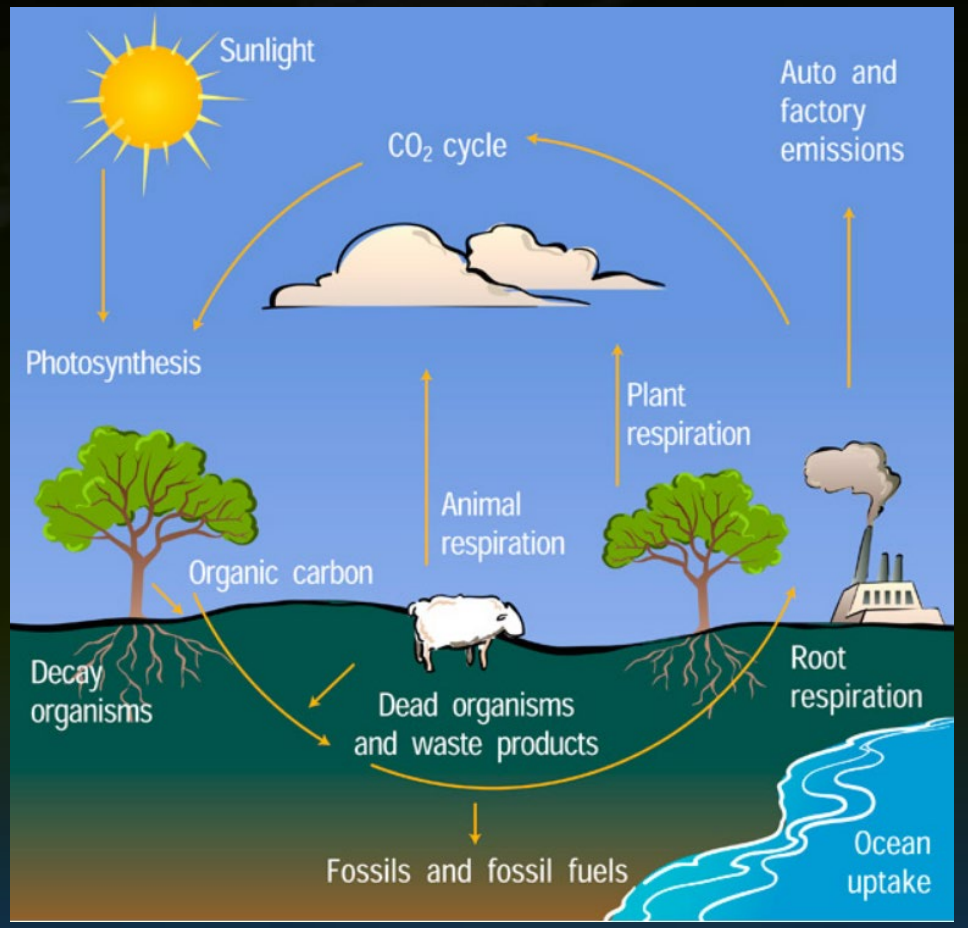
# Chapter 4 – Nature Based Solutions

- 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



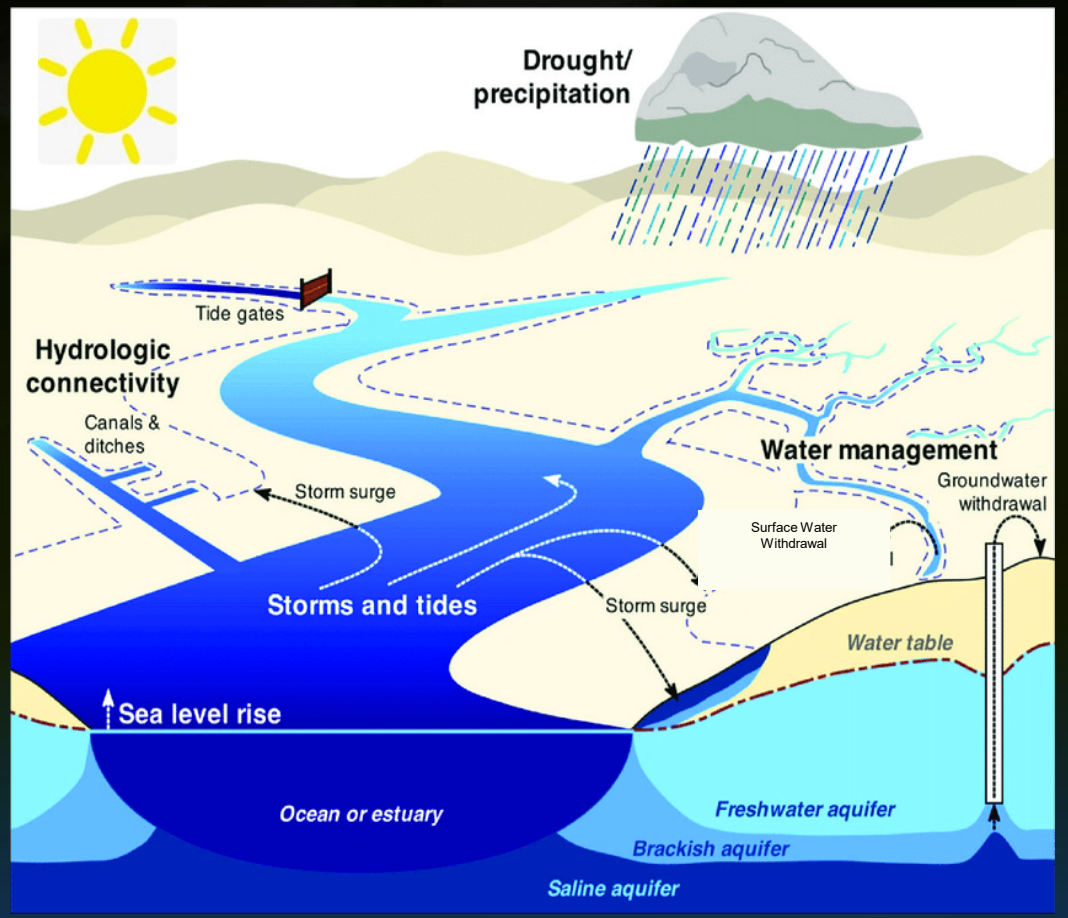
# Chapter 5 – Ecosystem Restoration and Carbon Storage

- 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%)

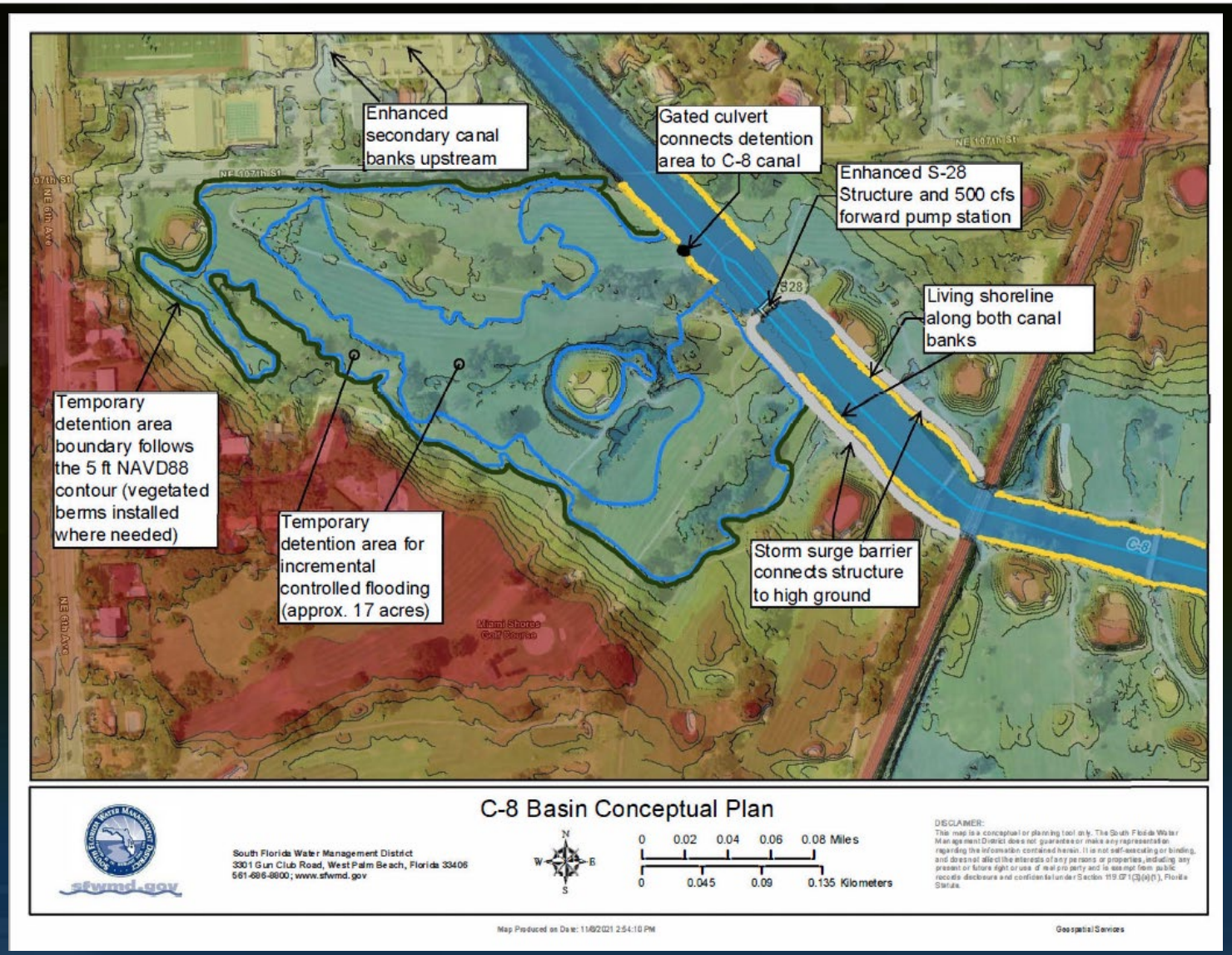
| | | | | Low Probability | | | | High Probability |
|---|---|---|---|---|---|---|---|---|
| Criteria | ID | Category | Weighting | 1 | 2 | 3 | 4 | 5 |
| Consequence of System Deficiency | 2.1 | Critical Assets / Lifelines | 6% | | | 0-25% of Critical Assets are within areas lower than 6FT or within 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

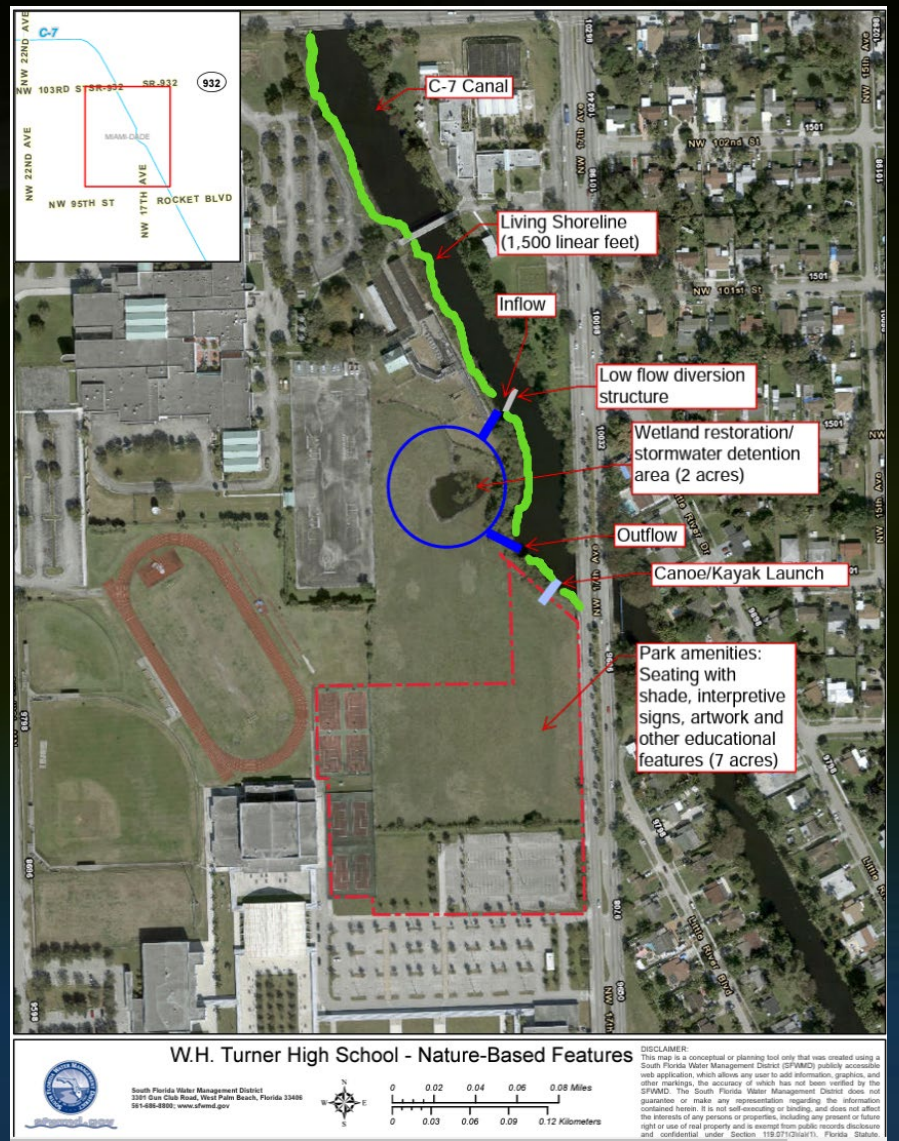
# Project Implementation: C-8 Basin Resiliency – FEMA BRIC Grant Recommended Award

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



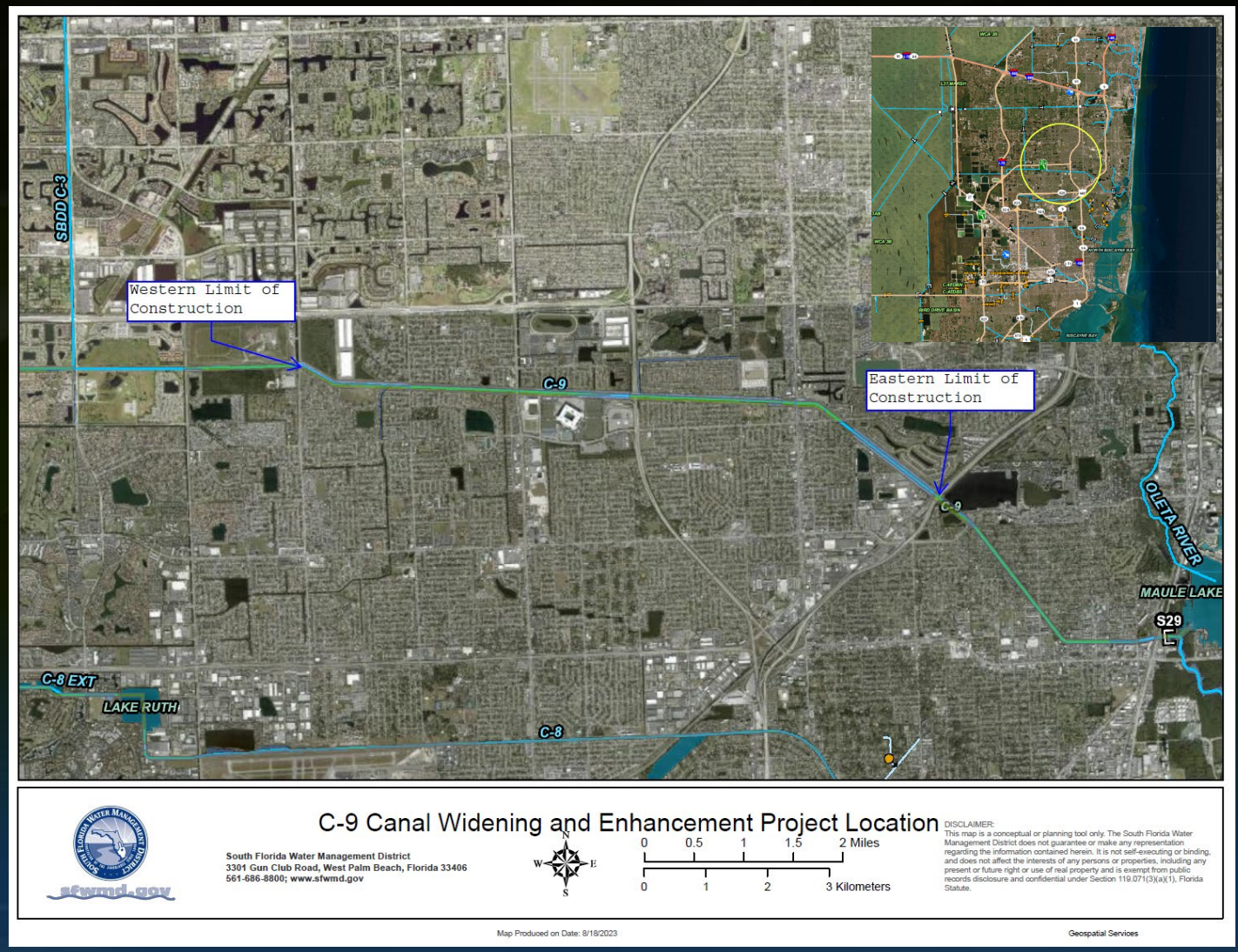
# C-7 Basin Resiliency – FEMA BRIC Grant Recommended Award

- 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



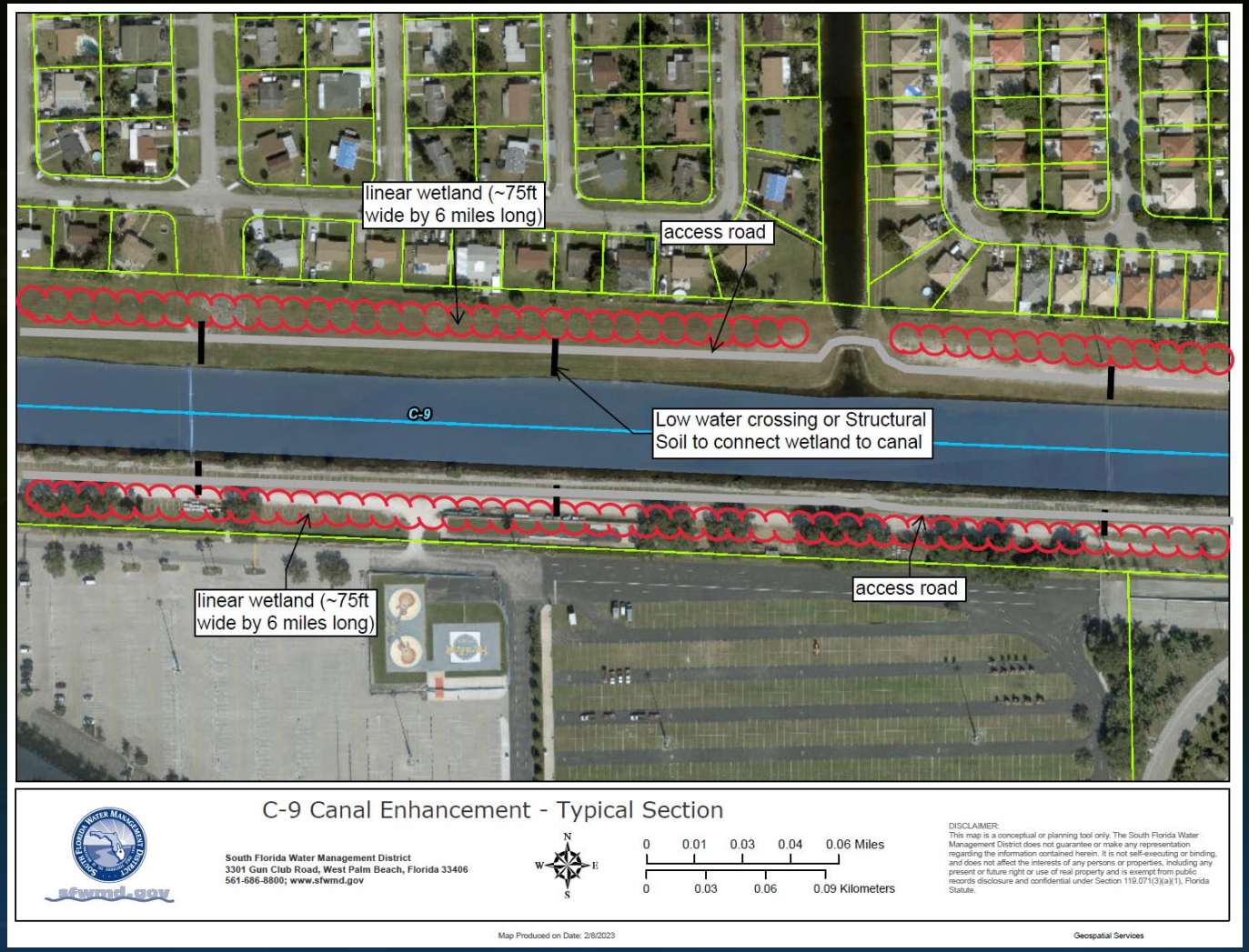
# C-9 Canal Enhancement Project – FEMA BRIC Grant Application

- 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



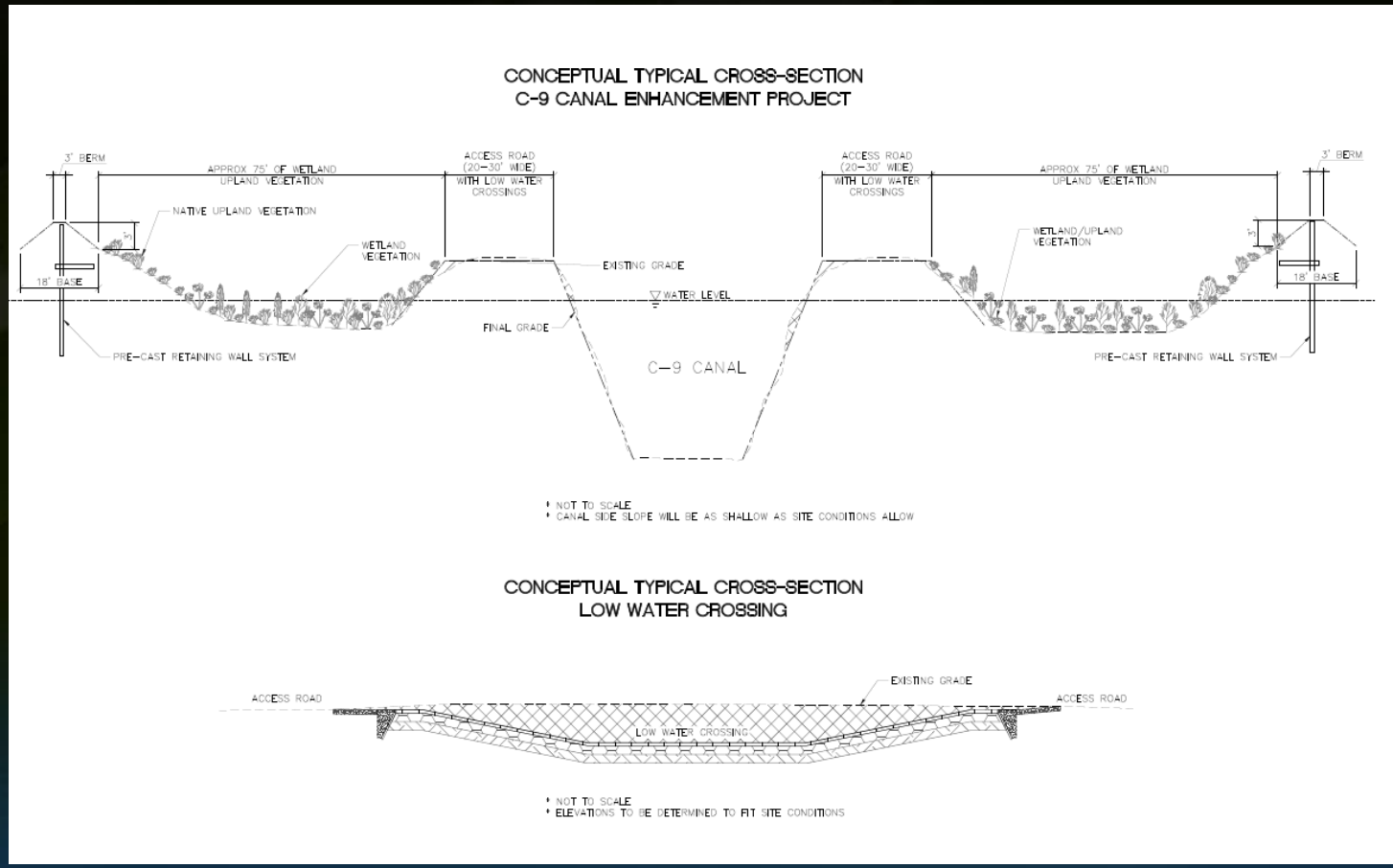
# Proposed Canal Enhancement Features and Benefits

- 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



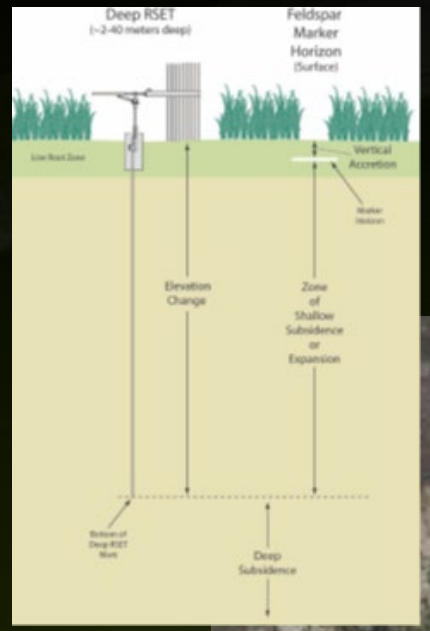
# Proposed Canal Enhancement Features and Benefits

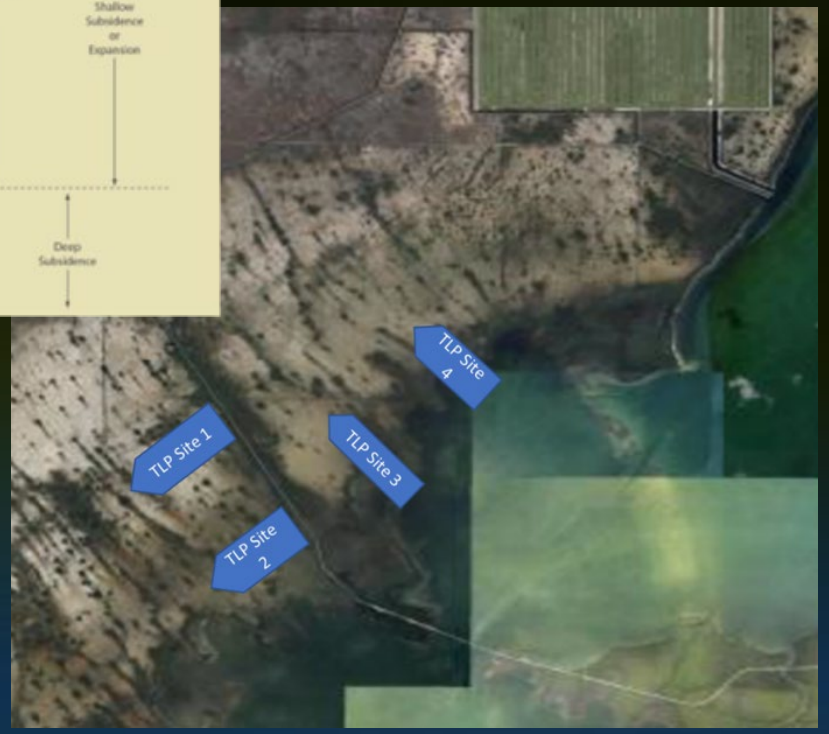
- Construct berms and access roads along canal banks
  - Improve access for operation and maintenance
  - Potential for increased public access for recreation
- Construct low water crossings along access road to connect wetland with canal
- Construct structural and/or nature-based features at secondary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



# 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

Ongoing --- Under Negotiation --- New Project

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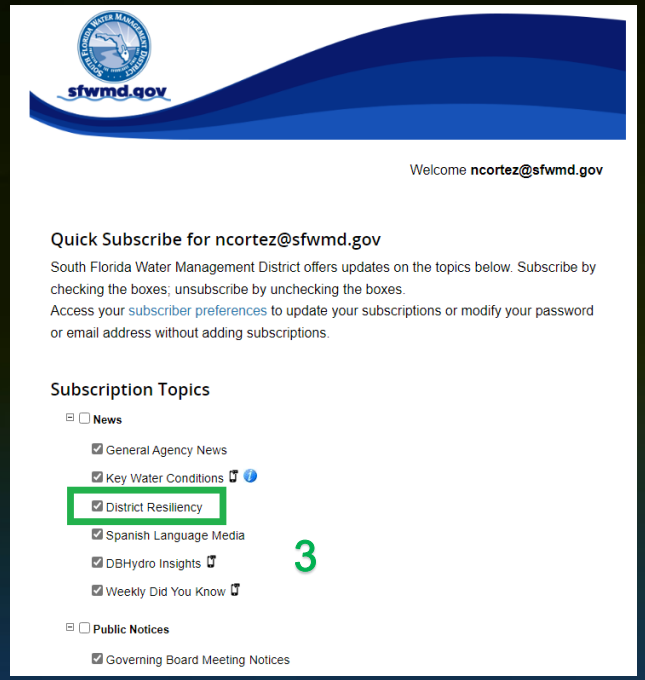

# Thanks!

# Questions?

# Comments?

www.sfwmd.gov/resiliency

Photo by Miami DDA