



# Resiliency Coordination Forum

May 24, 2023

# 1. Opening Remarks



**Wes Brooks, Ph.D.**  
Chief Resilience Officer  
Florida Statewide Office of Resilience

# Housekeeping

*Moderator: Yvette Bonilla*



## 2. Overview of District Resiliency Efforts



Carolina Maran, Ph.D., P.E., District Resiliency Officer

May 24, 2023

# 3. Resilient Florida



**Eddy Bouza**

Office of Resilience and Coastal Protection | Resilient Florida Program

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# 2021 LEGISLATION

“Always Ready Bill” Establishing the Program and 380.093, F.S.

Senate Bill 1954 / House Bill 7019  
*Unanimously passed in both chambers.*

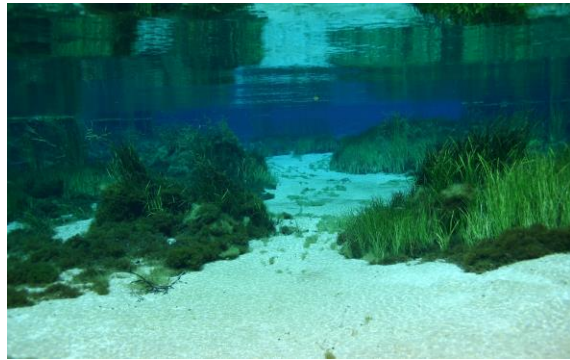
Became Law July 1, 2021.





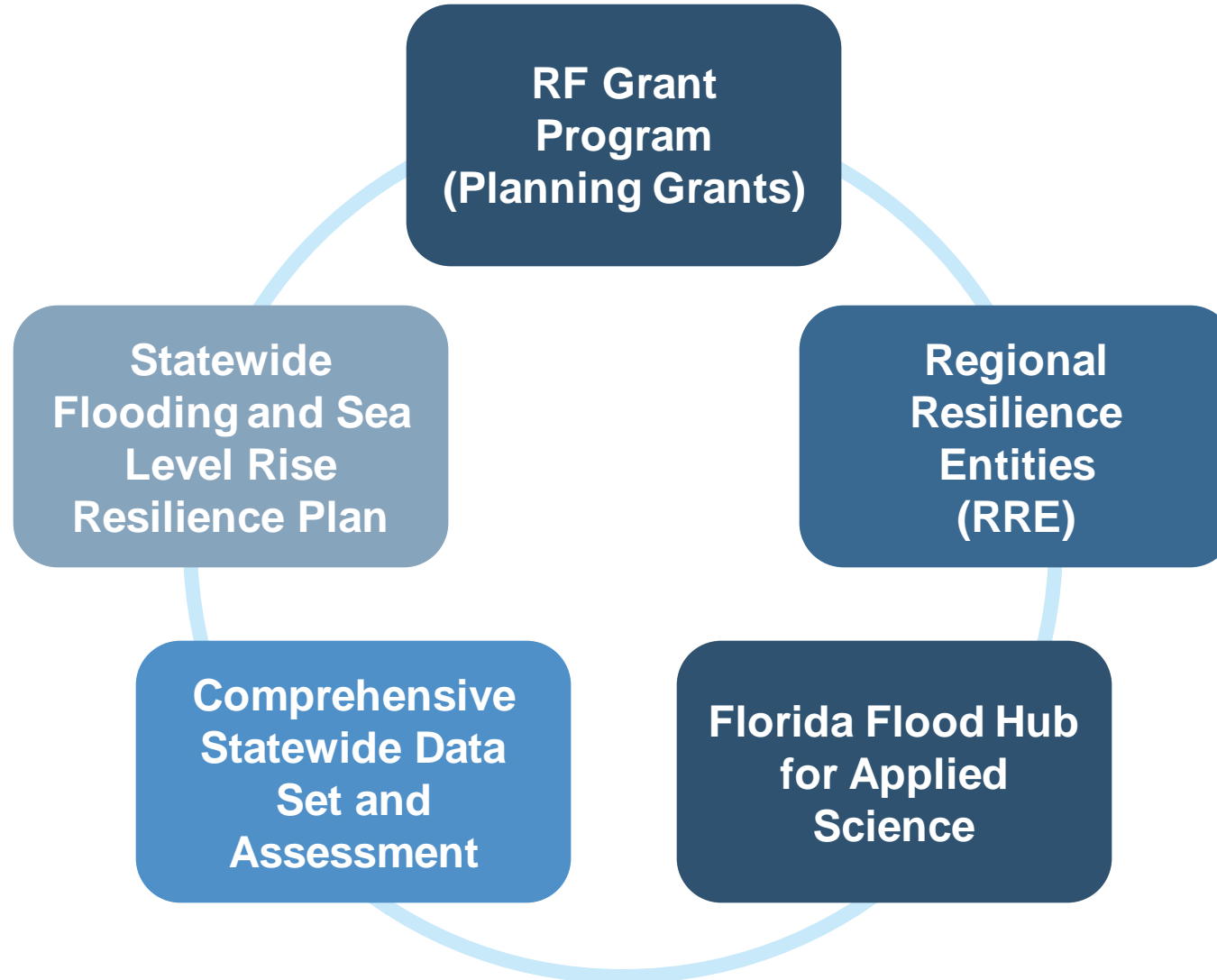
# 2022 LEGISLATIVE CHANGES

- Added or modified definitions, eligible entities, due dates.
- More support for small communities.
- Requires some Vulnerability Assessments (VAs) include specific rainfall analyses.
- Statewide Resilience Plan must include funding amount not less than \$100 M.





# PROGRAM ELEMENTS







# RESILIENT FLORIDA TIMELINE PROJECT AWARDS AND KEY DATES

**SB1954 becomes law**  
creating Resilient Florida  
Program

July 2021  
**FY 21-22**

December 2021

First Ever Statewide  
Flooding Resilience Plan  
proposed in budget  
**76 projects for \$270M  
over three years**

Appropriated funding  
awarded for  
**113 projects for \$404M**

February 2022

RFGP Planning Grants  
Awarded for Vulnerability  
Assessments  
**98 projects for \$20M**

May 2022

**Application Portal re-opens**

- 269 Implementation applications for \$1.5B
- 192 Planning applications for \$51M

July 2022  
**FY 22-23**

Second Preliminary Statewide  
Flooding and Sea Level Rise  
Resilience Plan submitted to  
Governor and Legislature for  
consideration during session

December 2022



# RESILIENT FLORIDA TIMELINE

## PROJECT AWARDS AND KEY DATES CONT.

Already-appropriated  
funding awarded for  
**74 projects for \$275M**



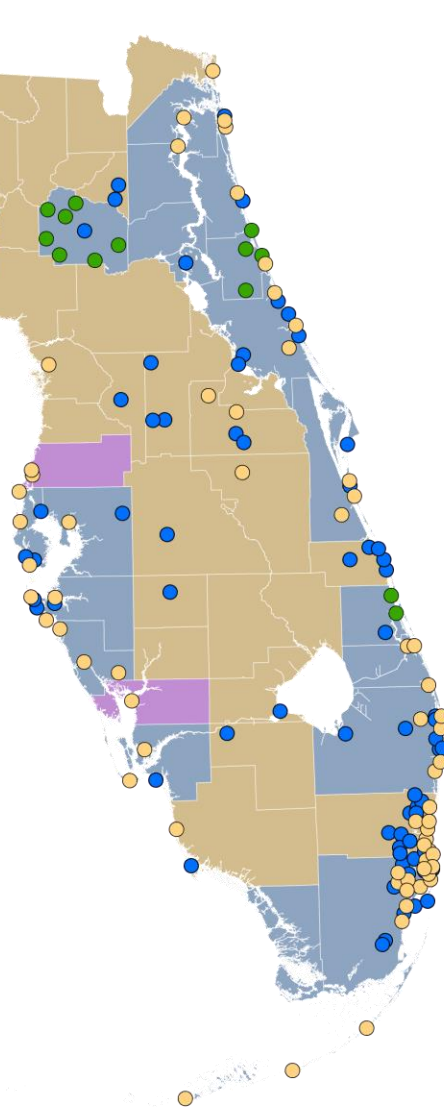
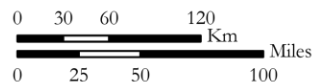


# RESILIENT FLORIDA GRANTS FOCUS ON PLANNING

## Distribution of Entities Awarded Planning Grants for Vulnerability Assessments

- Municipalities with Planning VA - FY21-22
- Municipalities Submitting Data through County VA - FY21-22
- Municipalities with Planning VA - FY22-23
- Municipalities Submitting Data through County VA - FY22-23
- Counties with Planning VA - FY21-22 \*
- Counties Submitting Data through Regional Entities - FY21-22
- Counties Submitting Data through Local Projects - FY21-22
- Counties with Planning VA - FY22-23

\* Duval County covered by the City of Jacksonville VA



- Direct state funding supporting VAs for 63 counties and 158 municipalities between FY21-22 and FY22-23.
- Regional Resilience funding supporting VAs for 9 counties.
- 2 county submitting data on their own.



# IMPLEMENTATION GRANT CYCLE TIMELINE FOR PORTAL APPLICATIONS (PAST & FUTURE)

**JULY 1**

Resilient Florida  
project portal opens  
to accept  
applications.

**SEPT. 1**

Deadline to submit  
proposed projects  
through portal.

**DEC. 1**

Statewide Flooding  
and Sea Level Rise  
Resilience Plan  
due.



# RESILIENT FLORIDA

## STATEWIDE FLOODING AND SEA LEVEL RISE RESILIENCE PLAN



- Prioritized based on criteria in statute and implemented via rule 62S-8, F.A.C.
- 3-year rolling plan of projects:
  - Fully-fund projects to completion.
- Years 1, 2 and 3 preliminary plans use completed local VAs.
- Year 4+ plans use projects identified in the Statewide Vulnerability Assessment.



# RESILIENT FLORIDA

## STATEWIDE FLOODING AND SEA LEVEL RISE RESILIENCE PLAN

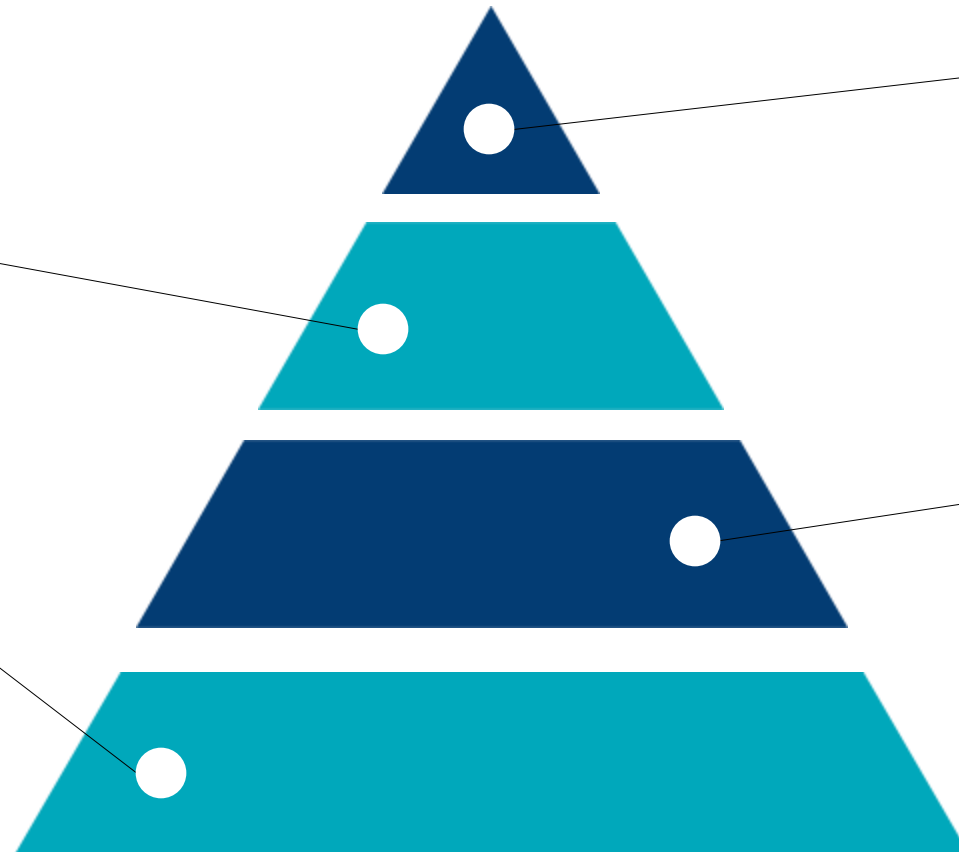
A TIERED REVIEW PROCESS FOR THE PLAN WAS CREATED IN SB 1954 AND CODIFIED IN SECTION 380.093, F.S., AND INCORPORATED IN DEP RULE 62S-8, F.A.C.

### TIER 3 (20%)

Local match, previous commitment and exceeding minimum requirements.

### TIER 1 (40%)

Addressing risks to critical assets and regionally significant assets, as well as existing efforts to reduce upland costs.



### TIER 4 (10%)

Innovation to reduce costs, regional collaboration, and financially disadvantaged communities.

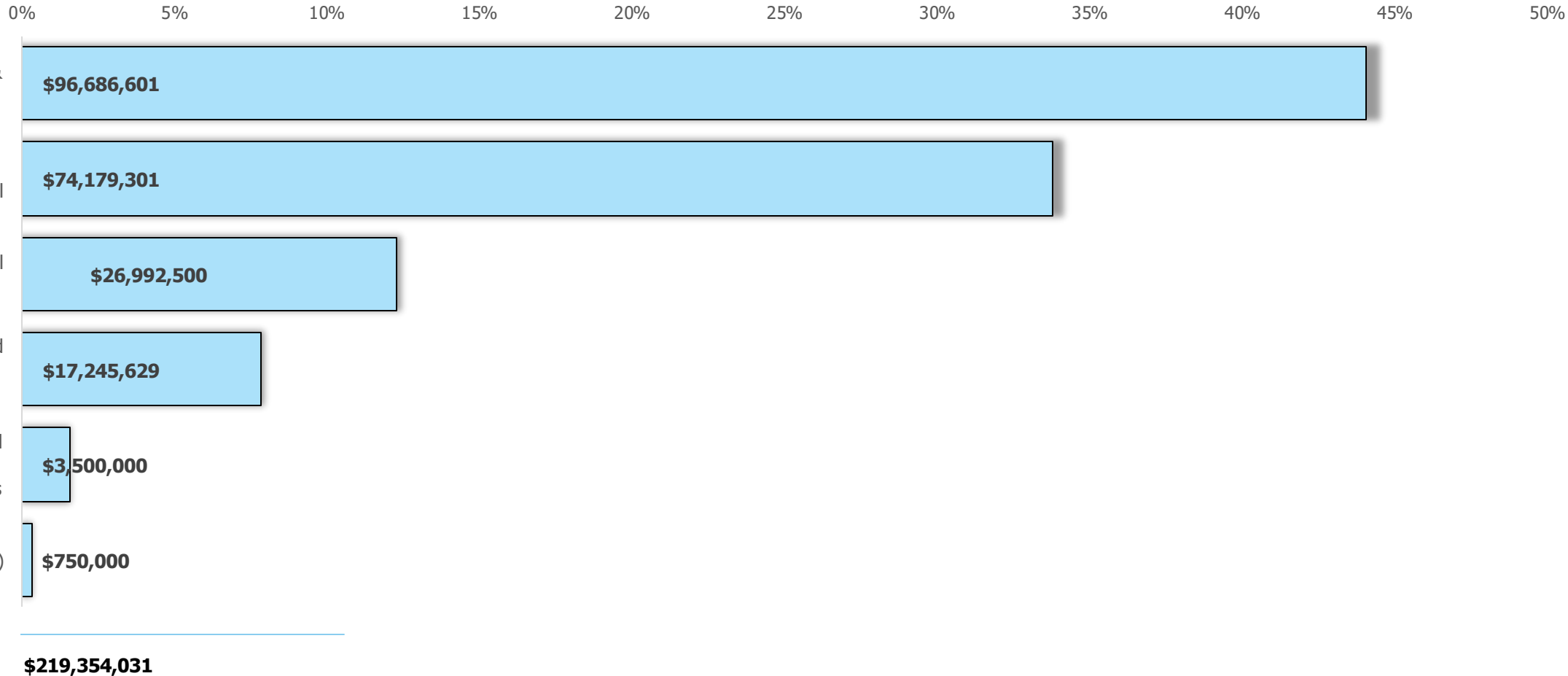
### TIER 2 (30%)

Existing flooding conditions, readiness to proceed, environmental options and exceeding minimum requirements.



# IMPLEMENTATION PROJECT TYPES – LOOKING AHEAD

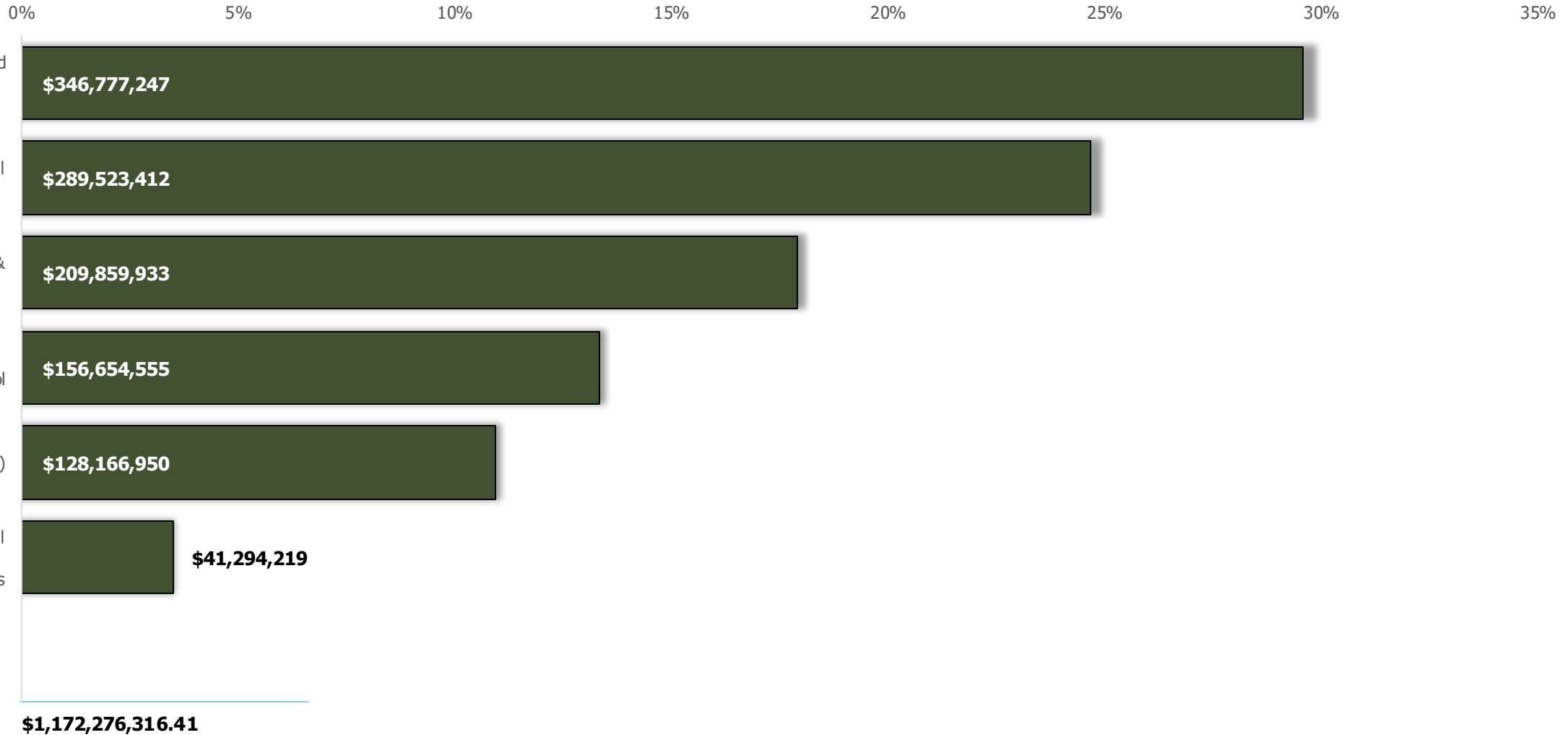
## FY 23-24 Statewide Flooding and Sea Level Rise Resilience Plan PENDING FINALIZATION OF STATE BUDGET APPROPRIATION





# IMPLEMENTATION PROJECT TYPES

## Resilient Florida Grants-to-date

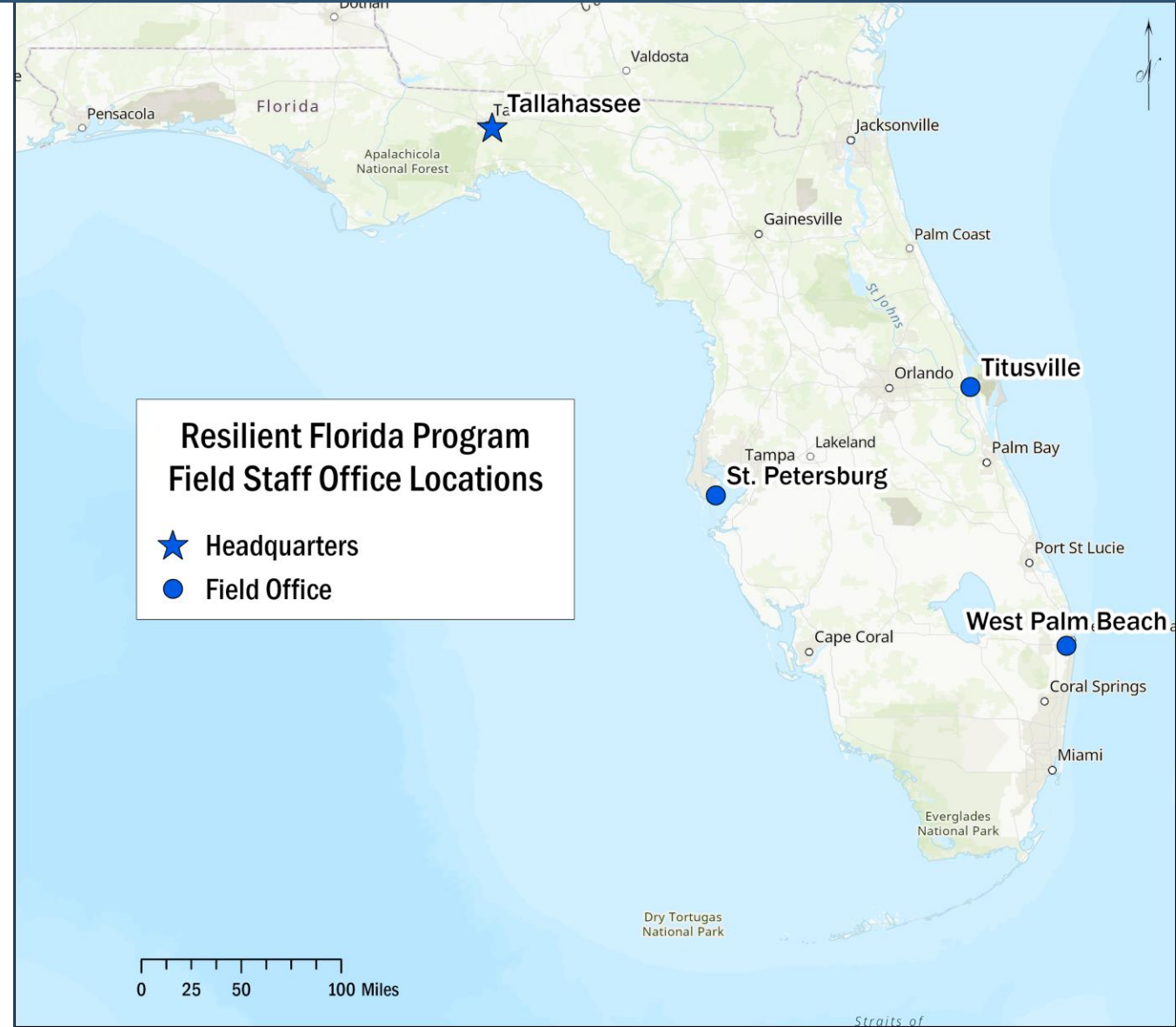






# SITE VISIT TEAM

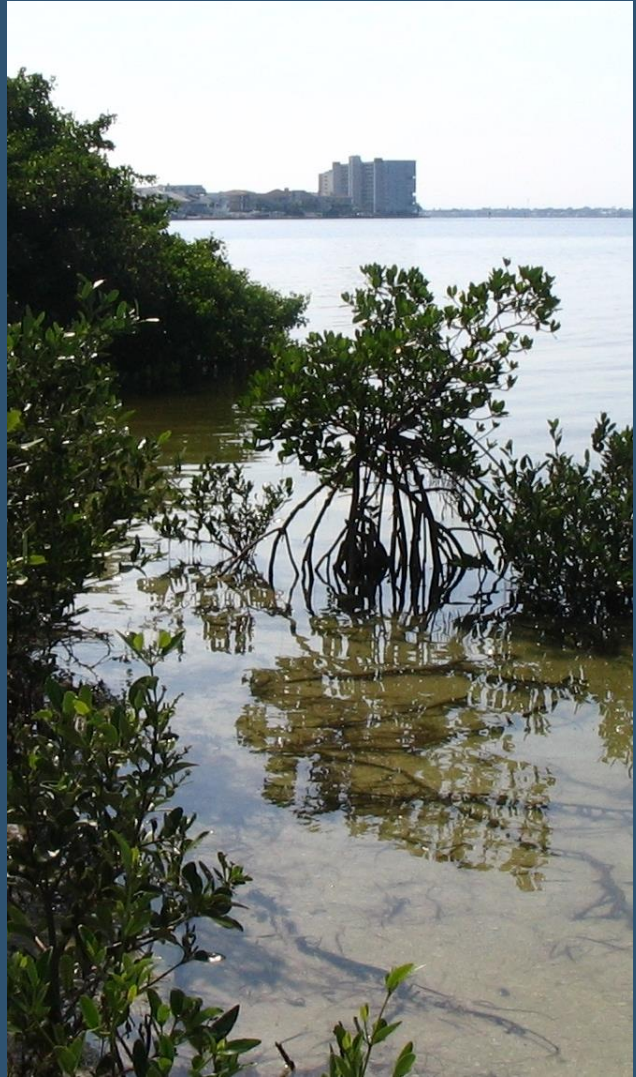
- Five regional staff throughout the state.
- Collect location data and information specific to funded projects.
- Types of site visits:
  - Preconstruction.
  - Interim.
  - Final.
- Liaisons between grantee and other RF staff.





# LOOKING AHEAD

## RESILIENT FLORIDA PROGRAM 2023



### PRE-APPLICATION PERIOD

- April 1 – June 15.
- Staff-time dedicated to pre-application support:
  - Eligibility checks.
  - Application review and feedback.
  - GIS shapefile(s) for project area(s).

### WEBINAR SERIES

- Florida Adaptation Planning Guidebook.
- 62S-8 Program Guidance for Applicants.
- Planning and Implementation Q&A + Portal Navigation.
- General Portal Q&A.

### CONTACT

- Office: (850) 245-7600.
- Web: <https://floridadep.gov/RFresources>.
- E-mail: [Resilience@FloridaDEP.gov](mailto:Resilience@FloridaDEP.gov).



# LOOKING AHEAD

## RESILIENT FLORIDA PROGRAM 2023



### OFFICE HOURS

Resilient Florida is holding weekly virtual “office hours” via Microsoft Teams during the pre-application assistance period. Office hours will be recurring on Tuesday mornings from 9:30-11:30 a.m. EDT and Thursday afternoons from 2:00-4:00 p.m. EDT.

*When:* Tuesdays, 9:30-11:30 a.m.

**How:** [Join online](#)

*When:* Thursdays, 2:00-4:00 p.m.

**How:** [Join online](#)



# THANK YOU

Office of Resilience and Coastal Protection | Resilient Florida Program

[Eddy.Bouza@FloridaDEP.gov](mailto:Eddy.Bouza@FloridaDEP.gov)

(850) 245-7562



# **4. SFWMD Sea Level Rise and Flood Resiliency Plan – 2023 Update**

**David Colangelo, District Resiliency Plan Coordinator**

# Today's Outline

- 2023 SFWMD Resiliency Plan Overview of Chapters
- Project Implementation Examples
- Next Steps



# Project Team

- Carolina Maran District Resiliency
- David Colangelo District Resiliency
- Francisco Pena District Resiliency
- Yitzy Rosenberg District Resiliency
- Nicole Cortez District Resiliency
- Zan Kugler District Resiliency
- Candi Heater Budget and Finance
- Julie Maytok Budget
- Lissette Sori Budget
- Lucine Dadrian Engineering & Construction
- Vijay Mishra Engineering & Construction
- Sandy Smith Engineering & Construction
- Akintunde Owosina Hydrology and Hydraulics
- Hongying Zhao Hydrology and Hydraulics
- Matahel Ansar Hydrology and Hydraulics

- Tibebe Dessalegne Hydrology and Hydraulics
- Jun Han Hydrology and Hydraulics
- Fred Sklar Applied Sciences
- 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 Jarmon 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 Remembered
- Everglades Foundation
- Friends of Biscayne Bay
- Central Florida Regional Planning Council

## Private Companies:

- 300 Engineering Group
- Conservation Concepts LLC

## Universities:

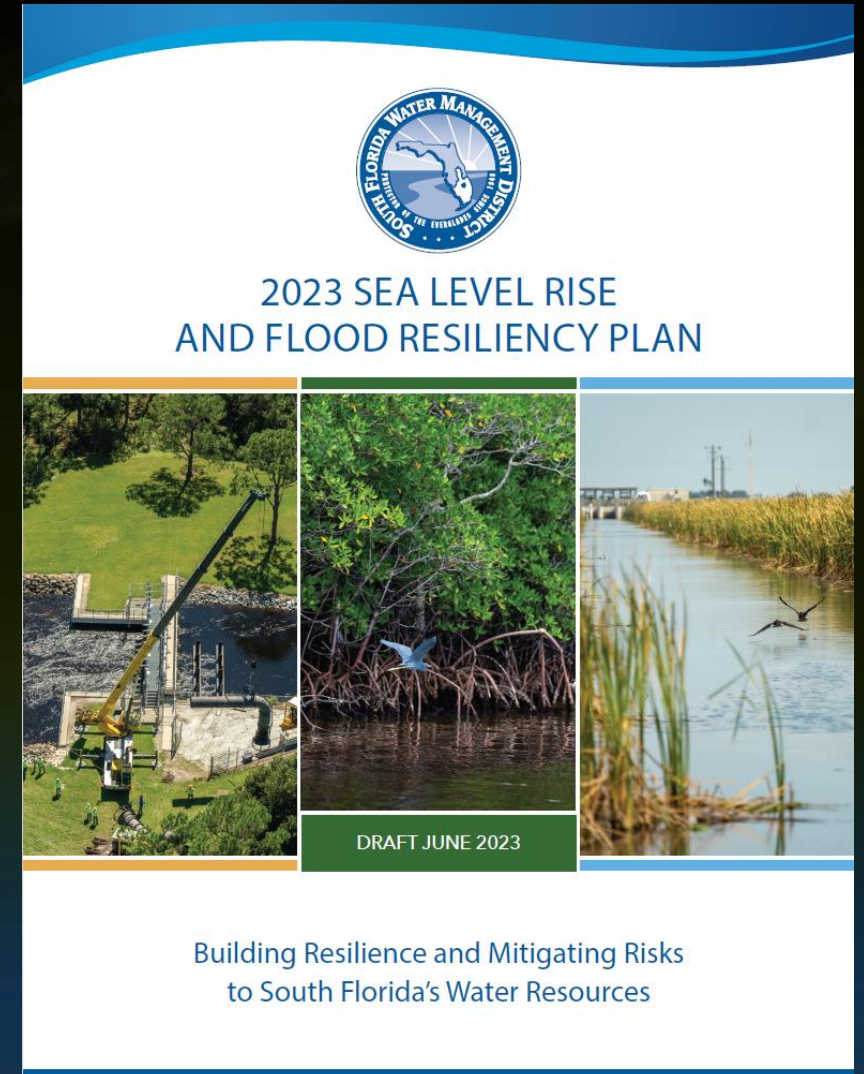
- University of Miami
- Florida International University

## 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



Building Resilience and Mitigating Risks  
to South Florida's Water Resources

# Chapter 1 – Our Resiliency Vision

## ➤ Risk Reduction

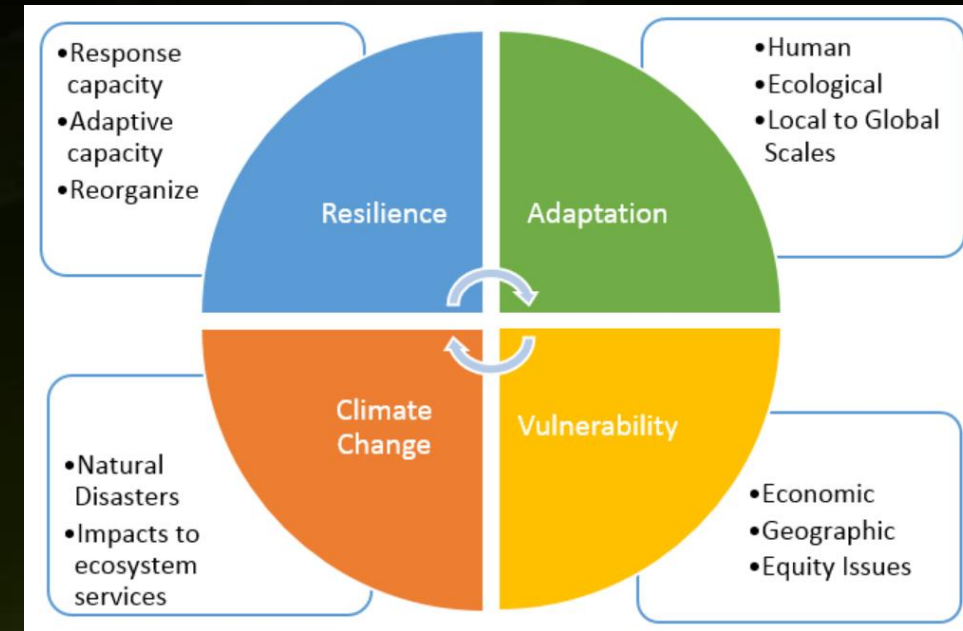
- Reduce risk while maximizing effectiveness

## ➤ Implementation Resources

- Project planning and management

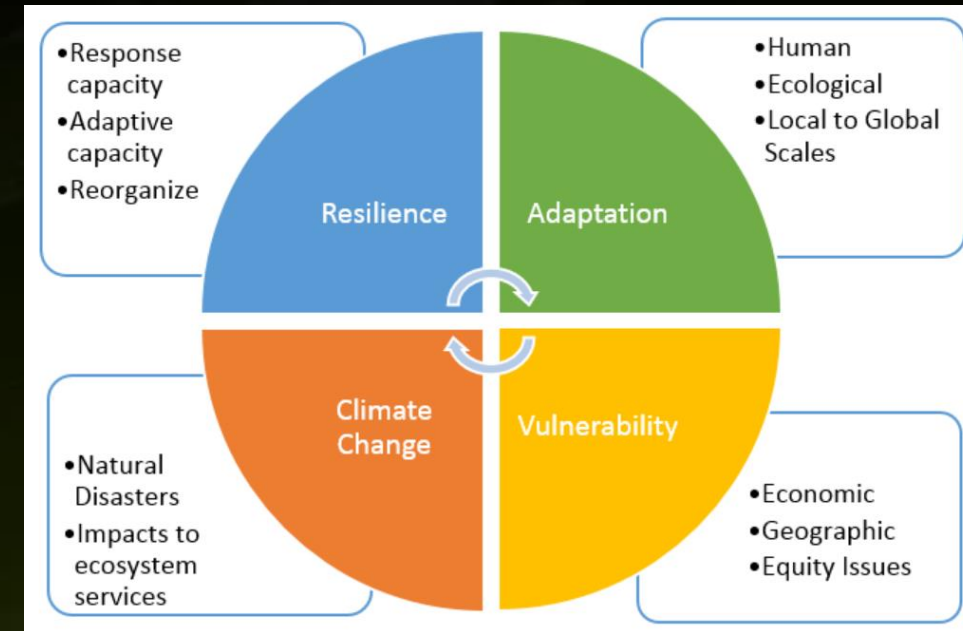
## ➤ Future Conditions

- 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



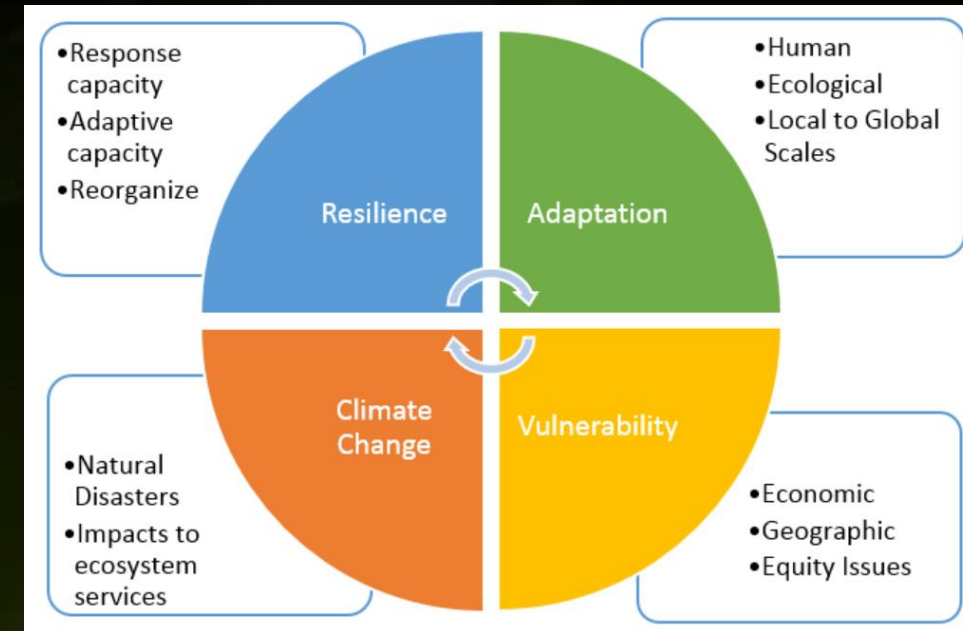
# Chapter 1 – Our Resiliency Vision

## ➤ 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
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Figure 1 – Aerial Image of the S20F Structure site



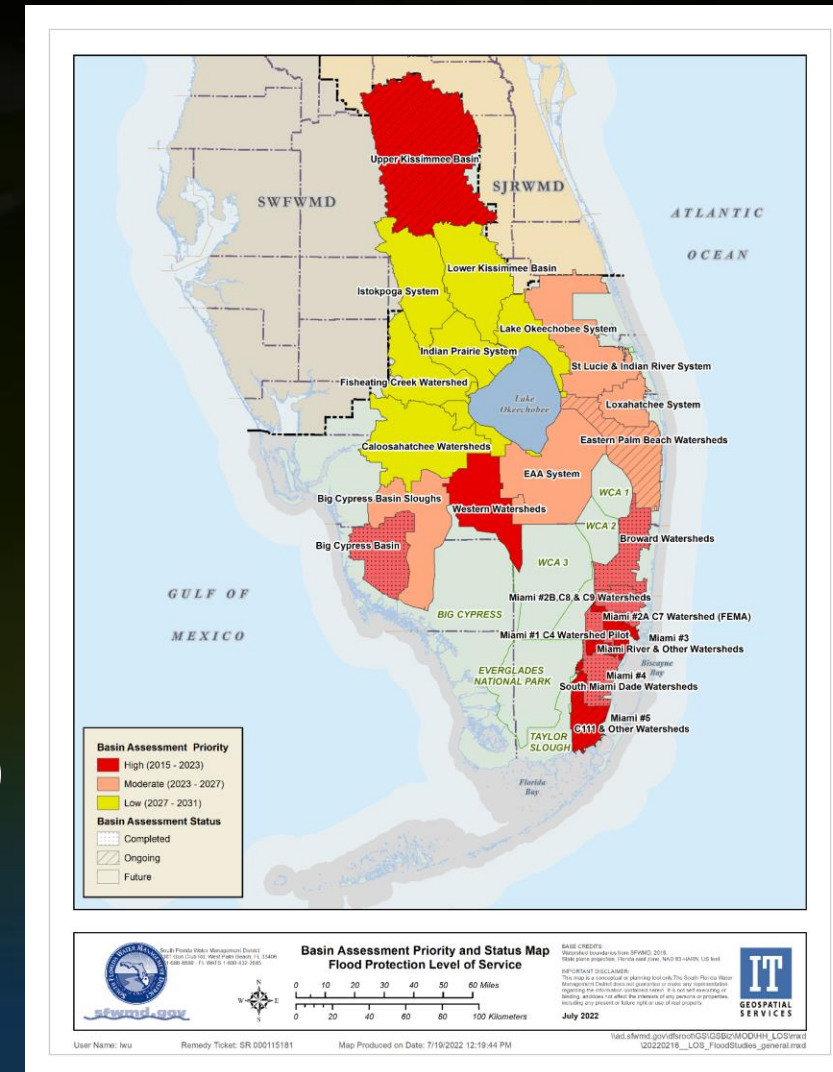
**Risk Based Asset Prioritization Matrix**

		1	2	3	4	5
5	5	10	15	20	25	
4	4	8	12	16	20	
3	3	6	9	12	15	
2	2	4	6	8	10	
1	1	2	3	4	5	
		1	2	3	4	5

Consequence of Failure (Y-axis) and Likelihood of Failure (X-axis)

# 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



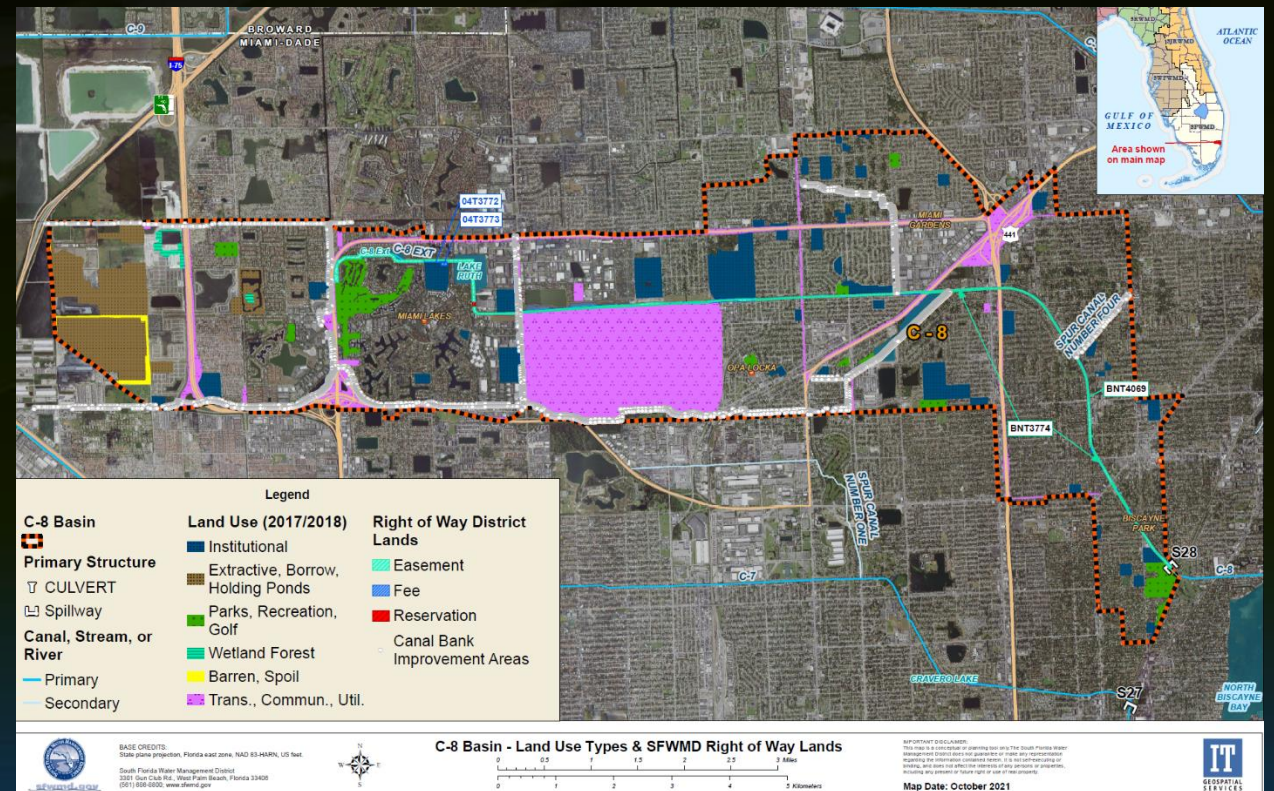
# Chapter 4 – Nature Based Solutions

## ➤ 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

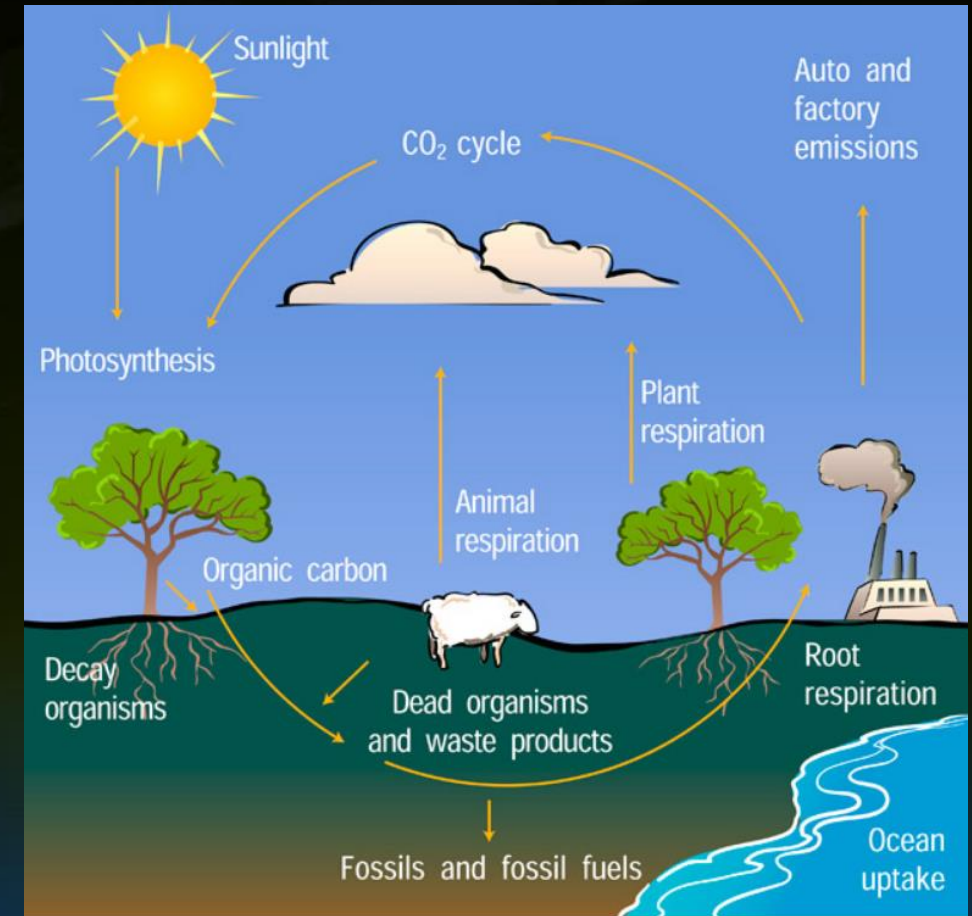
- Performance Metrics





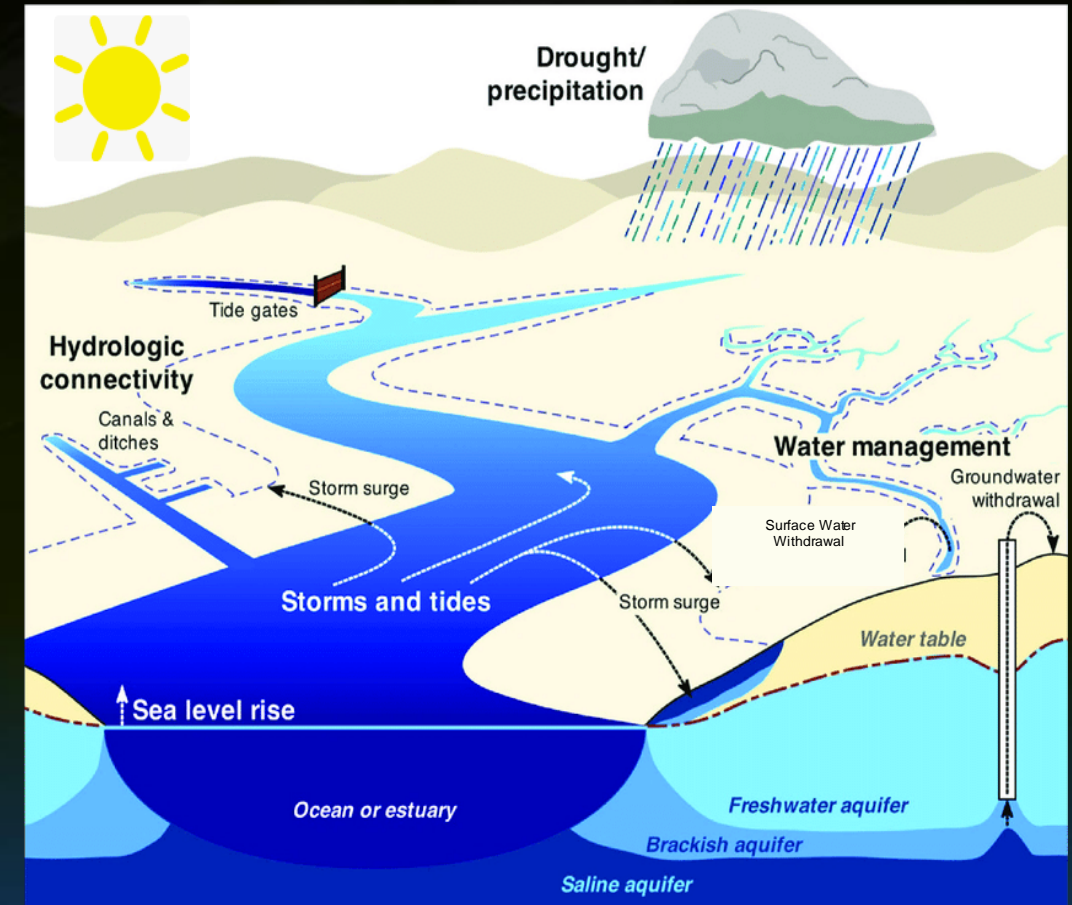
# Chapter 5 – Ecosystem Restoration and Carbon Storage

- 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%)

Criteria	ID	Category	Weighting	Low Probability			High Probability	
				1	2	3	4	5
Likelihood of System Deficiency	1.1	FPLOS Phase I Assessment Results (Current and /or Future Conditions)	15%	Future Conditions Less than 25-Year	Future Conditions 10-YR or less	Future Conditions 5-Yr or less	Current Conditions 10-YR or less	Current Conditions 5-YR or less
	1.2	Known Chronic and Nuisance Flooding Report (OR)	13%					Yes, flooded more than three times within the last five years or is experiencing ongoing erosion.
	1.3	No Alternatives/Backup to Mitigate Worst Case Scenario	3%			Partial		Yes
	1.4	Return Period of Overbank Flooding	6%	More than 100-yr	100-yr or less	50-yr or less	25-yr or less	5-yr or less
	1.5	Sea Level Resulting in Overbank Flooding		>3 ft	2 ft to 3 ft	1 ft to 2 ft	0.5 to 1 ft	0.5 ft or less
	1.6	Exceedance of Canal Normal Operating Range (OR)			Less than or Equal to 1 ft	More than 1 ft	> 2.5 ft	> 3.5 ft
	1.7	Finished Floor Elevation < Base Flood Elevation	3%			FFE < BFE + 1'	FFE < BFE + 2' (or 1' inland)	FFE < BFE + 3' (or 2' inland)
	1.8	FEMA Flood Zone Exposure						Yes
	1.9	Storm Surge Inundation Exposure				Yes, under Cat 3	Yes, under Cat 4	Yes, under Cat 5

# Chapter 8 – Characterizing and Ranking Resiliency Projects

## Ranking Criteria – Four Tiers

### 2. Consequence of System Deficiency (30%)

Criteria	ID	Category	Weighting	Low Probability			High Probability		
				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 8 – Characterizing and Ranking Resiliency Projects

## Ranking Criteria – Four Tiers

### 3. Project Benefits and System Enhancement (20%)

Criteria	ID	Category	Weighting	Low Probability				High Probability
				1	2	3	4	5
Benefits from System Enhancement	3.1	Nature-based Solutions	5%					Yes
	3.2	Ecosystem Restoration						Yes
	3.3	Cost Benefit Analysis	2.5%					BCA Larger than 1
	3.4	Previous State Funding	2.5%		Previous State Funding utilized in Preconstruction activities	Previous State Funding utilized in Design	Previous State Funding utilized in Permitting	Previous State Funding utilized in Construction
	3.5	Available Match	2.5%			Specifically identified local, state, or federal cost share, but the funds have not been appropriated or released at the time the applicant submits its proposal to the FDEP		Approved and adopted capital improvement plan
	3.6	Florida Building Code Design Criteria	2.5%					Yes
	3.7	Innovative Technologies	5%					Yes

# Chapter 8 – Characterizing and Ranking Resiliency Projects

## Ranking Criteria – Four Tiers

### 4. Structure Inspection Program Rating and Capital Improvement Program Status (10%)

				Low Probability			High Probability	
Criteria	ID	Category	Weighting	1	2	3	4	5
Project Status (SIP / CIP Programs)	4.1	SIP Overall Rating	5%			Overall C-3 or N/A	Overall C-4	Overall C-5
	4.2	Capital Improvement Program (CIP) Status	5%	Issue ID & Risk Ranking	PDR Approved / Project Kick-off Meeting and/or Suvey & Geotech Commenced	Partial Design	Design Complete / Permit Application Submitted	Initiated Construction

# Chapter 8 – Characterizing and Ranking Resiliency Projects

Coastal Structure Resiliency Projects	Likelihood of System Deficiency	Consequence of System Deficiency	Benefits from System Enhancement	Project Status	Total Points
S-26	38.25	24.16	18.75	5.00	<b>86.16</b>
S-29 & C-9 Basin Resiliency	35.30	24.16	17.50	4.00	<b>80.96</b>
S-27 & C-7 Basin Resiliency	39.50	21.26	16.25	3.00	<b>80.01</b>
S-21	39.50	19.26	16.25	4.00	<b>79.01</b>
G-57	37.05	21.56	16.25	4.00	<b>78.86</b>
S-28 & C-8 Basin Resiliency	36.50	21.06	16.25	3.00	<b>76.81</b>
S-37A	33.50	22.96	16.25	3.00	<b>75.71</b>
S-25B	35.25	15.06	18.75	5.00	<b>74.06</b>
G-58	39.50	14.01	16.25	4.00	<b>73.76</b>
G-93	33.50	18.01	16.25	6.00	<b>73.76</b>
S-22	36.50	16.96	16.25	3.00	<b>72.71</b>
S-25	37.00	15.26	16.25	3.00	<b>71.51</b>
S-197	37.05	13.35	16.25	3.00	<b>69.65</b>
G-54	27.50	22.76	16.25	3.00	<b>69.51</b>
S-20F	26.50	20.76	16.25	3.00	<b>68.51</b>
G-56	26.30	22.96	16.25	3.00	<b>68.51</b>
S-13	31.65	16.96	16.25	3.00	<b>67.86</b>
S-36	29.30	17.76	16.25	3.00	<b>66.31</b>
S-20G	26.50	17.01	16.25	4.00	<b>63.76</b>
S-123	26.50	16.76	16.25	3.00	<b>62.51</b>
S-33	19.30	22.56	16.25	3.00	<b>61.11</b>
S-20	26.50	13.35	16.25	3.00	<b>59.10</b>
S-21A	23.50	13.01	16.25	5.00	<b>57.76</b>

Other Priority Projects	Likelihood of System Deficiency	Consequence of System Deficiency	Benefits from System Enhancement	Project Status	Total Points
Big Cypress Basin Microwave Tower	39.50	22.96	17.50	4.00	<b>83.96</b>
S-61 Spillway Enhancement and Erosion Control	36.50	23.16	16.25	7.00	<b>82.91</b>
C-29, C-29A, C-29B and C-29C Canal Conveyance Improvements	36.50	23.16	16.25	6.00	<b>81.91</b>
S-59 Enhancement and C-31 Canal Conveyance Improvements	36.50	23.16	16.25	6.00	<b>81.91</b>
S-58 Structure Enhancement and Temporary Pump	36.50	23.16	16.25	6.00	<b>81.91</b>
L-31E Levee Improvements	35.85	20.16	16.25	4.00	<b>76.26</b>
EMMA	37.00	13.35	18.13	7.00	<b>75.48</b>
Corbett Levee Water Control Structure	36.25	15.01	17.50	6.00	<b>74.76</b>
South Miami-Dade Curtain Wall	31.00	21.96	18.75	3.00	<b>74.71</b>

**Legend**  
**Priority Levels**

- High
- Medium High
- Medium
- Low



# Chapter 9 – Priority Implementation Projects

## ➤ 23 Projects at Coastal Water Control Structures

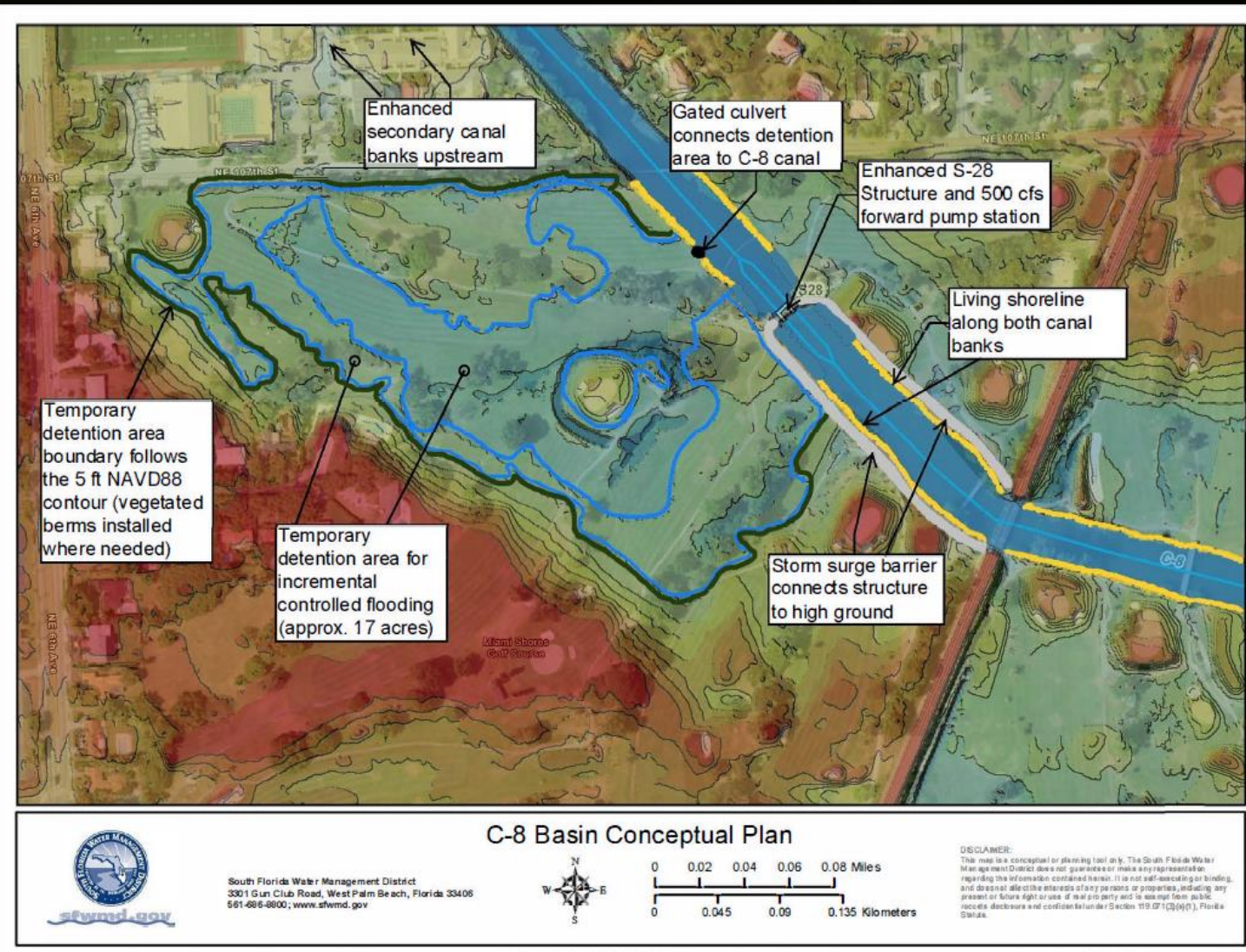
- Enhance and adapt structures to restore original level of service
- Implement additional regional strategies (including basinwide storage, flood barriers/levees, conveyance and nature-based features)

## ➤ 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 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 Application

- 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



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# C-9 Basin Resiliency – FEMA BRIC Grant Application

- Enhance S-29 Structure and construct storm surge barrier
- Install Forward Pump Station
- Install living shoreline and wetland restoration/stormwater detention area at Pickwick Lake
- Build canoe/kayak launch area
- Install park amenities with shaded area for educational/recreational use



**City of North Miami Beach - Nature-Based Features**

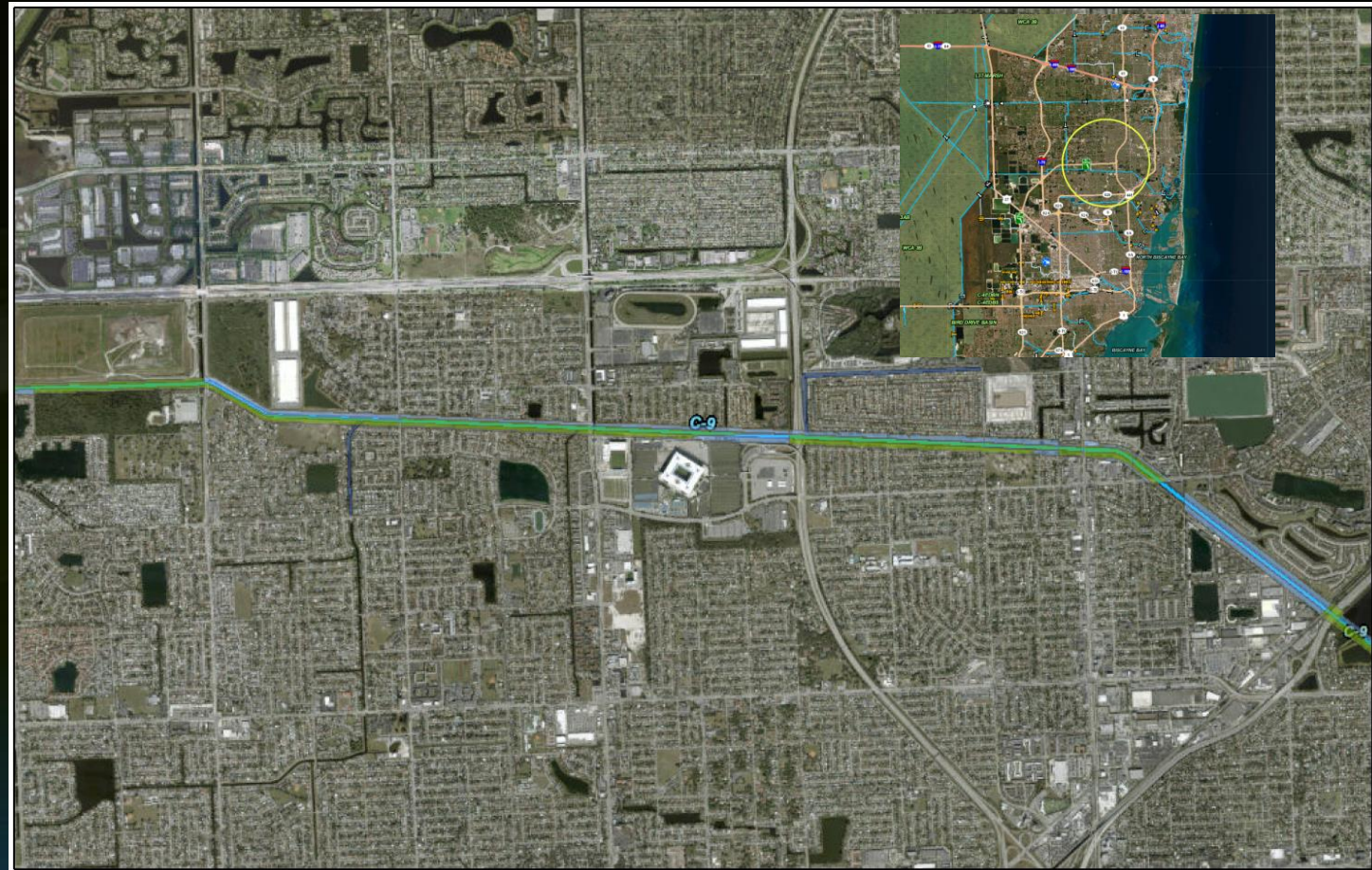
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Scale: 0 0.02 0.04 0.06 0.08 Miles  
0 0.03 0.06 0.09 0.12 Kilometers

# Proposed Project: C-9 Canal Enhancement Project – EPA Planning Grant

- FPLOS study results recommended widening a portion of C-9 Canal to enhance conveyance and storage capacity
- Forward pumps alone are not enough to achieve desired level of service
- Project footprint along seven-mile section of C-9 Canal
- Chosen based upon potentially available District owned ROW



## C-9 Canal Widening and Linear Marsh Potential Project Footprint

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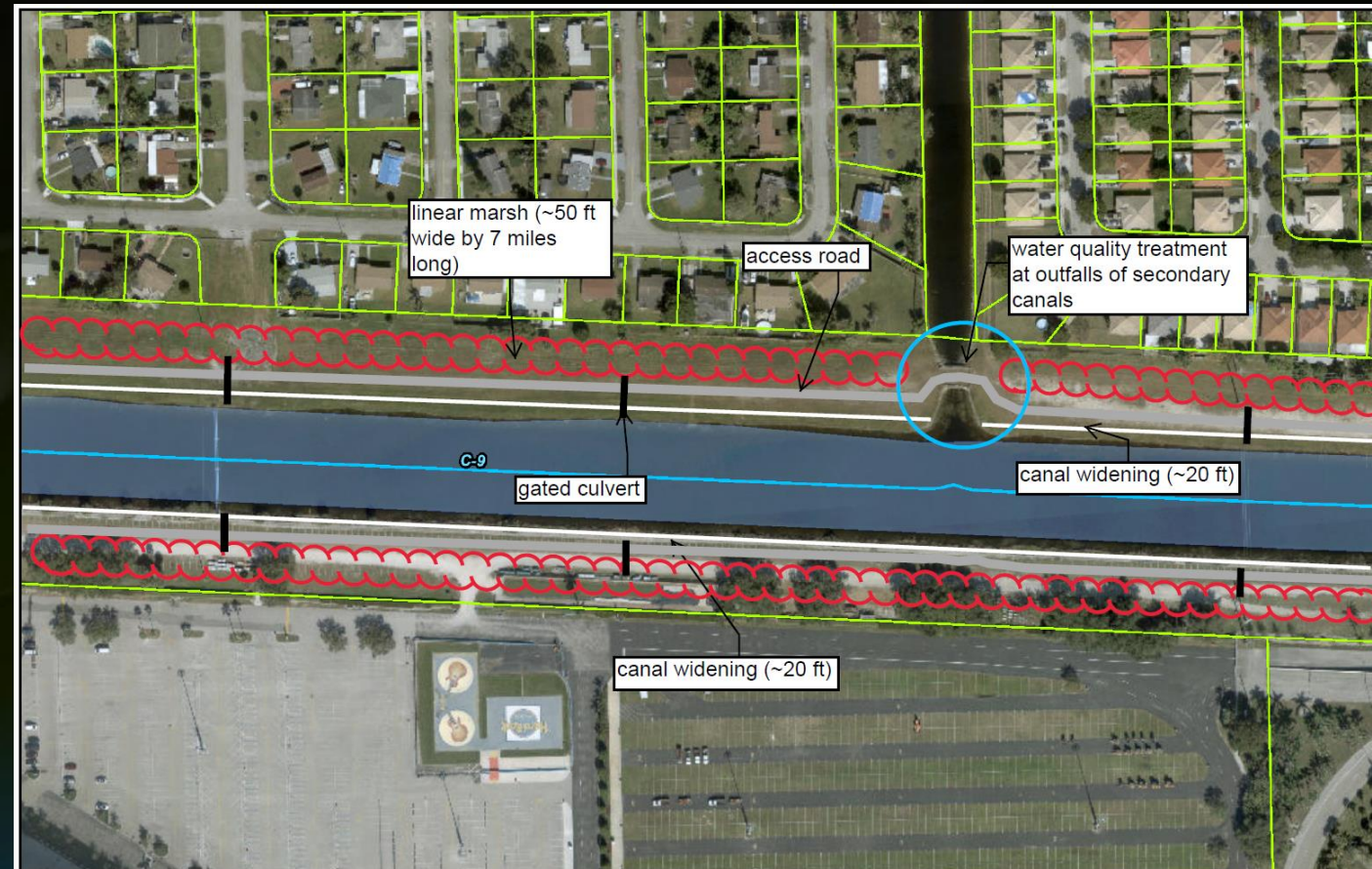
# Proposed Canal Enhancement Features and Benefits

## ➤ Canal widening

- Enhance conveyance and storage
- Improve flood protection level of service

## ➤ Construct wetland adjacent to canal

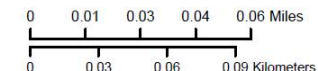
- Create additional stormwater storage
- Restore floodplain connectivity
- Increased evapotranspiration in wetland can contribute to reduction in peak stage and flood duration
- Enhance water quality
- Improve fish and wildlife habitat



C-9 Canal Widening and Linear Marsh - Typical Section



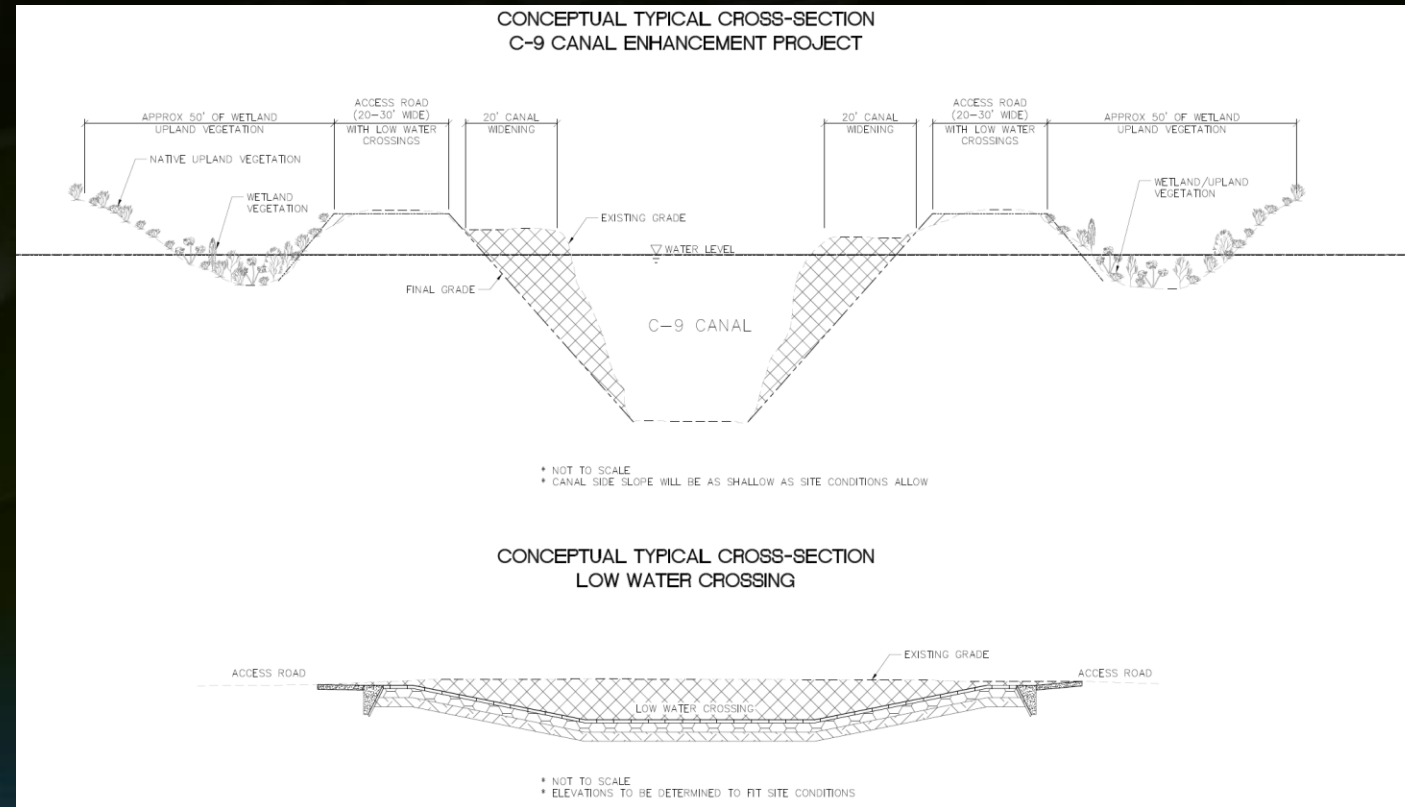
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# Proposed Canal Enhancement Features and Benefits

- Construct 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



# Coastal Structures Enhancement and Self Preservation Mode – Resilient Florida Grant

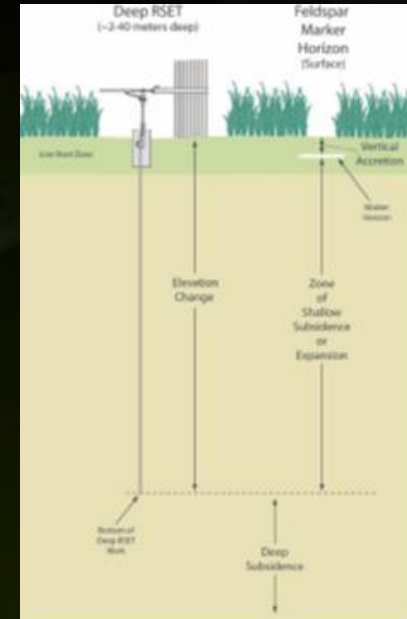
- Urgent need to optimize and enhance operation of structures during storm surge and high tide events
- Includes enhancing electronic/mechanical components, modifying gates on 20+ Coastal Structures
- This project will allow water control structures to operate autonomously during extreme events
  - Reduce upstream flooding risks
  - Protect water supply against saltwater intrusion





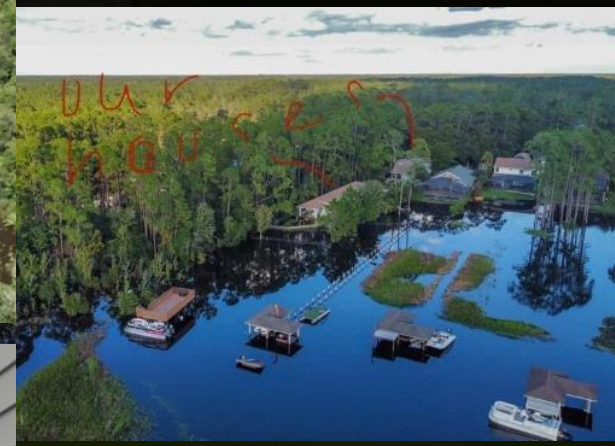
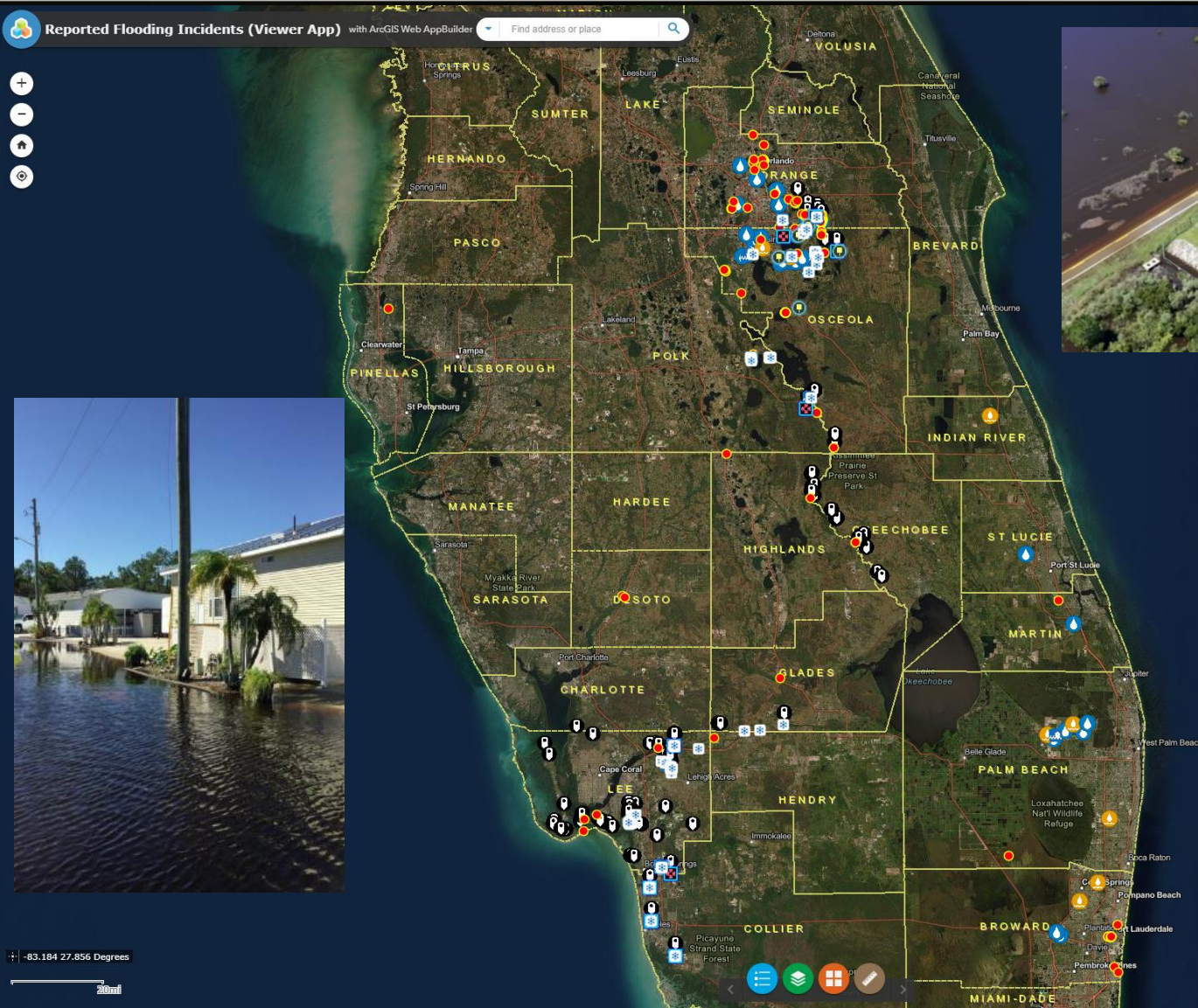
# Everglades Mangrove Migration Assessment

- 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



# Upper Kissimmee Basin

## Hurricane Ian's Observed Flooding Occurrences

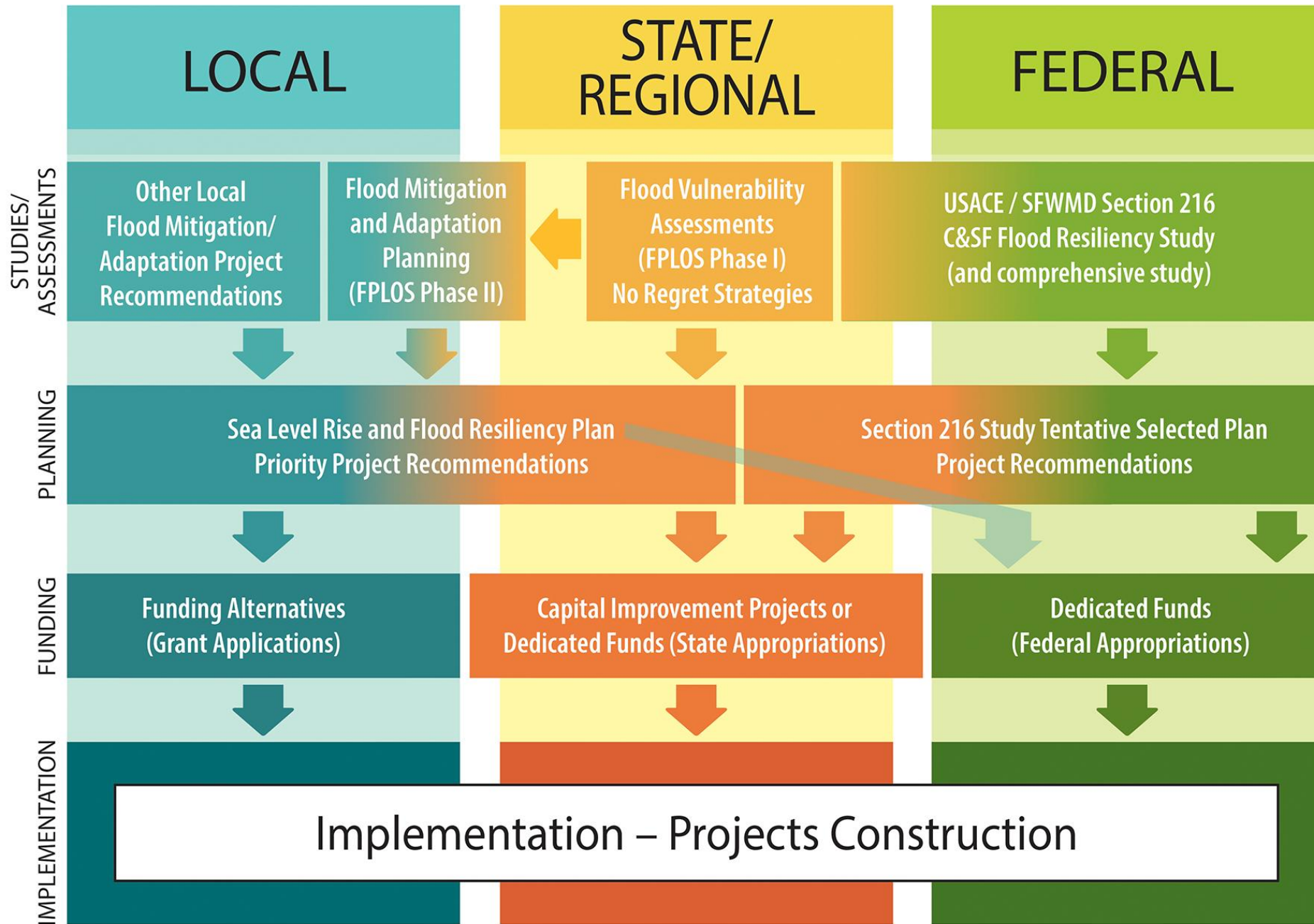


# Post Hurricane Ian Projects

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



# Next Steps

- **May 24<sup>th</sup>** – Today Plan is released for public comments

[Sea Level Rise and Flood Resiliency Plan | South Florida Water Management District \(sfwmd.gov\)](#)

- **June 23<sup>rd</sup>** – Deadline for Public Comments

Submit comments to: [resiliency@sfwmd.gov](mailto:resiliency@sfwmd.gov)

- **July 31<sup>st</sup>** – Deadline to Incorporate Public Comments
- **September 1<sup>st</sup>** – List of Priority Projects Due to FDEP
- **October 1<sup>st</sup>** – HB513 Report Due to Governor's Office and Legislature

# 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

Home >> News Events

News Releases  
News Archive (Oct. 2009 - July 2020)  
Fact Sheets  
Calendar  
Photo and Video Resources  
Public Meetings and Forums

## News and Meetings

Our large network of communication channels allows you to interact with the District, share opinions, participate in public meetings and engage with us in real-time. You can also use these channels to read statements and news releases, find information during an emergency, or learn about our mission and the work we do. The following is a directory of all of the District's communication channels.

Subscribe for Email  
News  
Photo & Video  
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@SFWMD

Welcome [ncortez@sfwmd.gov](mailto:ncortez@sfwmd.gov)

### Quick Subscribe for [ncortez@sfwmd.gov](mailto:ncortez@sfwmd.gov)

South Florida Water Management District offers updates on the topics below. Subscribe by checking the boxes; unsubscribe by unchecking the boxes. Access your [subscriber preferences](#) to update your subscriptions or modify your password or email address without adding subscriptions.

#### Subscription Topics

News

- General Agency News
- Key Water Conditions
- District Resiliency
- Spanish Language Media
- DBHydro Insights
- Weekly Did You Know

Public Notices

- Governing Board Meeting Notices

**Thanks!**

**Questions?**

**Comments?**

[www.sfwmd.gov/resiliency](http://www.sfwmd.gov/resiliency)



# Brief Break





Monroe County  
Resiliency Efforts  
Rhonda Haag, Chief  
Resilience Officer

May 24, 2023  
SFWMD Forum



MONROE COUNTY  
FLORIDA



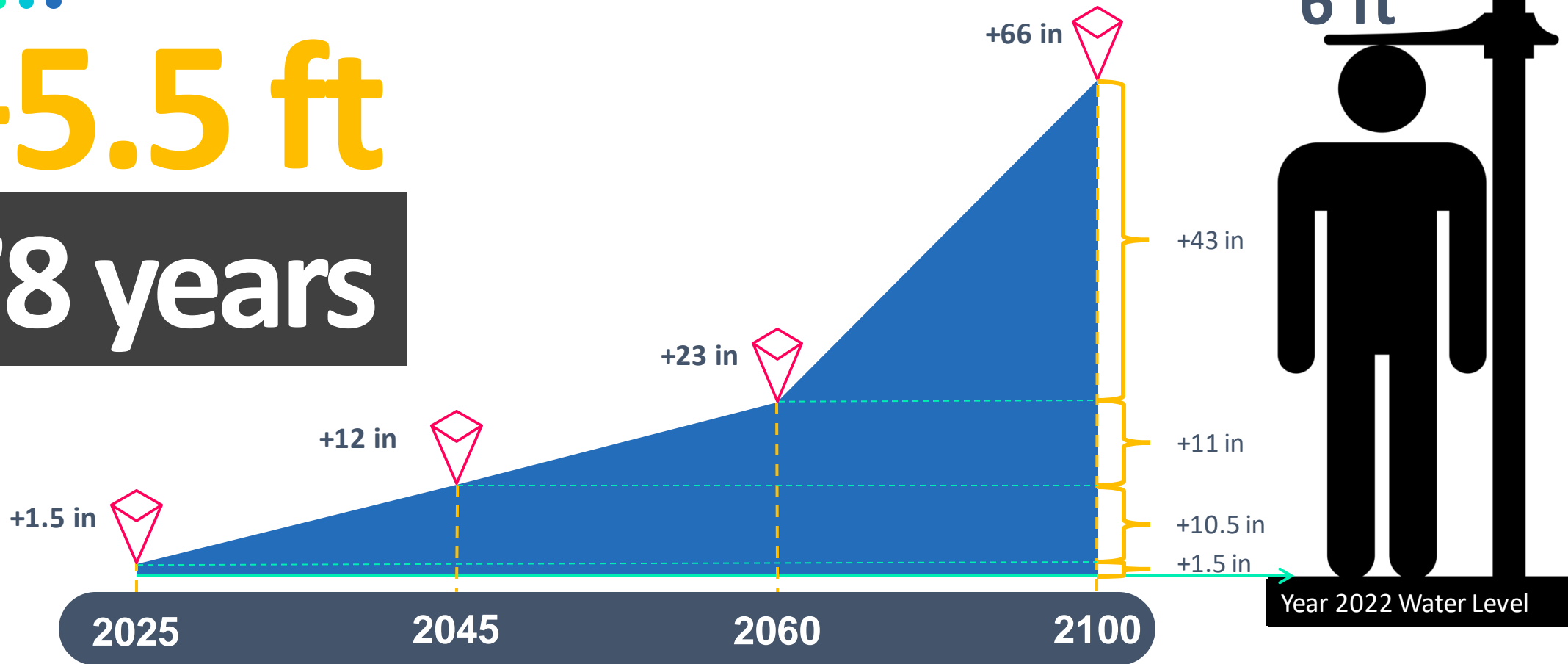
**wsp** ERIN L. DEADY, P.A.

# Sea Level Rise Projections



# +5.5 ft

# 78 years



SLR Condition: NOAA 2017 Intermediate-High

SE FL Regional Climate Compact Updated Projections 2019

# Resiliency Initiatives

# County Resiliency Initiatives



## Green Keys!

5-year work plan, 165 recommendations

- Recommendations included:
  - Pilot Roads Projects
  - Improve elevation data
  - Engineering level analysis of transportation impacts countywide (this Roads Adaptation Project)
- Numerous other vulnerability recommendations, including updates when significant new data available



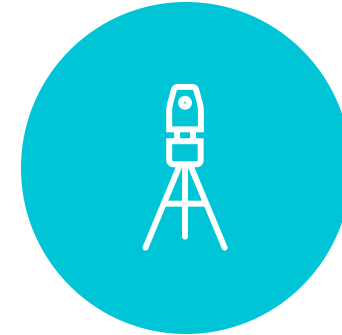
## Energy and Climate

Element in comprehensive Plan (2016)



## Pilot Road Elevation Projects

Sands neighborhood in Big Pine and Twin Lakes in Key Largo projects initiated in 2016 with design/permits phase completed in 2020.



## LiDAR Elevation Data

New Roads Mobile LiDAR elevation data for all County maintained roadways, completed in 2019.

Municipal effort underway



## Grants for SLR Planning and Projects

- Sands Road Project Big Pine
- Twin Lakes Roads project Key Largo
- Stillwright design only – Key Largo

# SLR Related Planning Efforts

In Process



## Roads Adaptation Plan

- Identify sea level rise impacts to roads and drainage comprehensively
- Identify policy and funding options
- Develop engineering alternatives and Implementation Plan



## Vulnerability Assessment for County non-Road Assets

- Assessment is being updated separately for habitat, buildings, and infrastructure.
- This is funded by Resilience Planning Grant



## Comprehensive Plan

- Peril of Flood amendments to address State requirements (drafted)
- Adaptation Action Areas (in process)
- Other amendments as necessary



## Pending Grants and Projects in application review

- Twin Lakes x 2 (State & Fed)
- Sands Subdivision x 2 (State & Fed)
- Regional Roads Adaptation Planning with Municipalities and 6 County Neighborhood evaluations (State)
- Natural Areas Adaptation Plan (State)
- Stillwright Point (State)

# New! Resilience Planning & Living Shoreline Projects



1. \$50,000 Pigeon Key Resilient Design
2. \$120,843 Watershed Mgmt. Plan for CRS Points
3. \$139,350 Vulnerability Assessment Update to meet State Requirements
4. \$150,000 Natural Resource Habitat Assessment DEP funded w/\$75,000 match
5. \$200,000 Harry Harris Park Resilient Redesign w/ \$100,000 match.
6. \$900,000 Long Key Living Shoreline
7. \$3 Million Duck Key Living Shoreline/Breakwater Repairs

# Municipal Projects Managed by County

1. **Watershed Management Plans and Vulnerability Assessments** (County, Marathon and Layton / Key Colony Beach) \$797,722
2. **Mobile Lidar Surveying** \$481,934 underway in all 5 municipalities, funded by municipalities. To be complete December 2023
3. **Street Elevation Planning** \$1.5 Million to begin fall 2023. Local funding.



## Funding Allocation by Jurisdiction

## Phase II Design

Islamorada	\$416,771
Key West – doing their own	\$561,735
Marathon	\$471,133
Layton	\$12,080
Key Colony Beach	\$42,281
<b>Total</b>	<b>\$1,504,000</b>



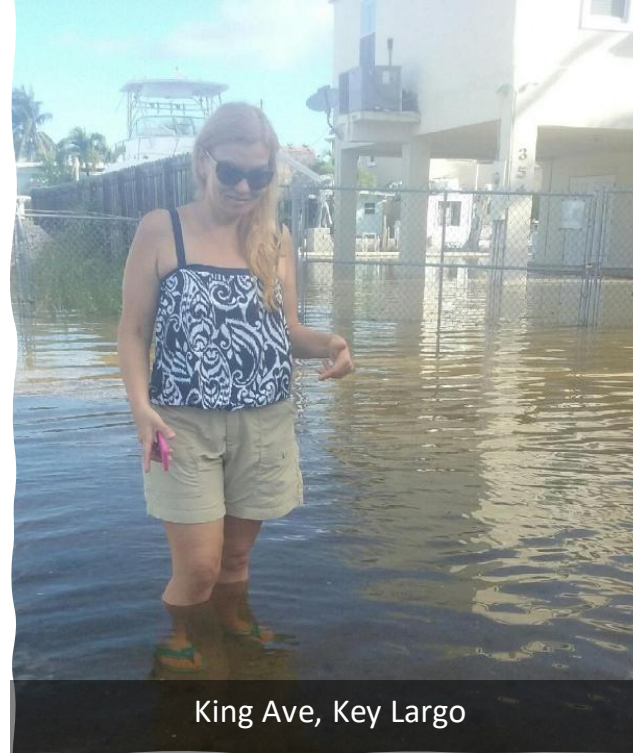
# Roads Adaptation

**Use science and engineering to identify What roads are vulnerable to sea level rise, When and How High they need to be Elevated.**

# Monroe County Roadway Vulnerability Study

## GOALS:

- 1) Help make the Keys more able to withstand sea level rise impacts (become more resilient)
- 2) Help maintain access to homes and businesses
- 3) Help protect property values.



King Ave, Key Largo



Sexton Way, Key Largo

©Rhonda Haag



King Ave, Key Largo



Kennedy Drive, Key West

# Monroe County Vulnerability



## Vulnerabilities

- Increasing water levels due to Climate Change
  - Sea Level Rise
  - King Tides
- Extreme weather events

## Why?



- 220-mile archipelago of ancient coral islands
- Low elevations (Roadway and private properties)
- Porous Limerock

# Vulnerability and Criticality Assessment

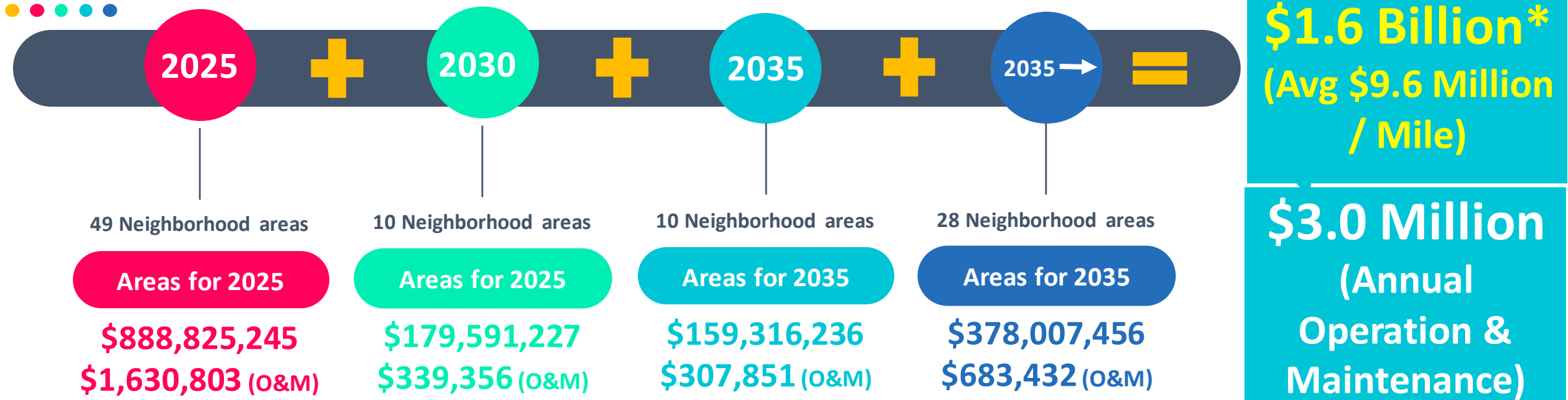


Vulnerability Evaluation Factors	Weighting Percentages
Roadway Surface Inundation Depth	60%
Roadway Groundwater Clearance	25%
Roadway Inundation Due to Storm Surge	5%
Roadway Surface Wave Impact Potential	5%
Roadway Existing Pavement Condition	5%



Criticality Evaluations Factors	Weighting Percentages
Vulnerability Score	50%
Number of Residential Units	25%
Roadways Associated with Critical Facilities (Police, Fire, etc.)	10%
Wetlands/Natural Habitats associated with Road Segment	5%
Roadway Functional Classification and Evacuations Routes	5%
Non-Residential Focus Species associated with Road Segment	3%
T&E and Focus Species Associated with Road Segment	2%

# Adaptation Plan and Program Cost



Projected **SLR + King Tides** will affect the following:

(SLR Condition: NOAA 2017 Intermediate-High + King Tides)

	2045	Unincorporated Countywide %
Miles of Vulnerable and Critical County Maintained Roadways	166 MI	53%
# of Residential Units along County Maintained Roadways	13,399 Res. Units	76%

\* Cost estimate is conceptual and does not include design, right-of-way acquisition, harmonization/cost to cure, and legal fees. Cost estimates are preliminary and subject to change. Cost Estimate is based on 2020 Dollars.

# Roads Next Steps

---

1. **Special Assessments Development** for Canals and Roads –2023.
  2. **15 Resilient FL Road Adaptation Grants** for \$380 Million applied in August 2022, top 3:
    - a) **Upper Keys / Key Largo** - Winston Waterways Largo Gardens  
\$30.7 Million (50% match)
    - b) **Middle Keys / Conch Key** - awarded  
\$7 Million (50% match)
    - c) **Lower Keys / Big Coppitt**  
\$49 Million (50% match)**TOTAL \$86.7 Million / \$43 Million Match**
- 



**U.S. Army Corp  
Florida Keys  
Coastal Storm Risk**



US Army Corps  
of Engineers®  
Norfolk District



MONROE COUNTY  
FLORIDA

# FLORIDA KEYS COASTAL STORM RISK MANAGEMENT FEASIBILITY STUDY APPROVED PAN





## OVERARCHING EXISTING PROBLEMS

- **Structures (commercial and residential) and critical infrastructure in the Florida Keys are vulnerable to damage from inundation caused by storm surge.**
- **Critical transportation routes (U.S. Route 1) are vulnerable to damage from wave energy and erosion caused by coastal storms. Inundation caused by storm surge limits or in some locations prevents vehicle travel on U.S. Route 1, the only evacuation route out of the Florida Keys**
- **Critical infrastructure, U.S. Route 1, and structures throughout the Florida Keys are vulnerable to damage caused by coastal storm events which contributes to both direct and indirect life loss and overall human health and safety risk to the population of the Florida Keys.**
- **There are rich environmental resources that are unique to the study area that are vulnerable to the effects of coastal storms.**

# PLAN



## The Recommended Plan Includes:

- U.S. 1 shoreline stabilization** (revetment) in 6 areas
- Nonstructural measures for residential and non-residential structures at risk:
  - Elevation of residential structures**- 4,698 structures
  - Floodproofing of commercial properties and critical infrastructure**- 1,052 commercial structures / 53 critical infrastructure buildings

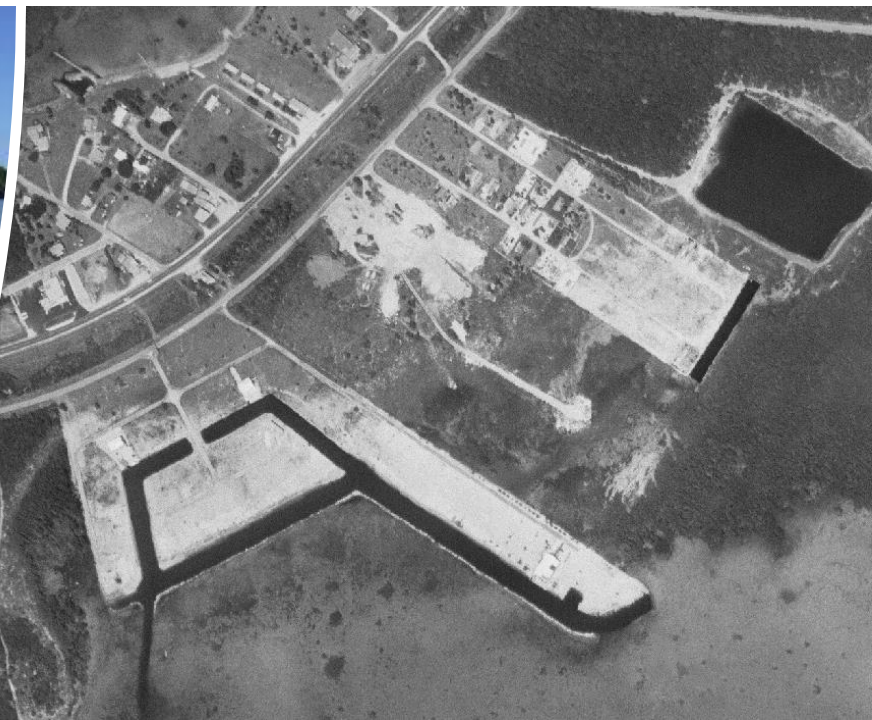
## Estimated Project Costs and Benefits:

- Total Estimated Project Cost (65/35 cost share):  
**\$2,772,359,000**
  - 65% federal funding of project = \$1,802,033,000
  - **35% non-federal funding of project = \$970,326,000**
- Total Average Annual Benefit: \$131,603,000
- Benefit Cost Ratio is 1.5

# **Environmental Resilience Projects**

# Breakwaters - Protecting Neighborhoods

- \$2.1 Million Tavernier Breakwater Repair / Air Curtain Project Construction anticipated for fall 2023. HUD funded.
- \$1.3 Million Rock Harbor Breakwater Repair / Air Curtain project Construction anticipated for fall 2023. HUD funded.



# Canal Restorations for FY23-24

1) **Canal #105 backfill and culvert.** Tavernier / Key Largo. Cost estimate \$668,870.

2) **Canal #255 organic muck removal, backfilling, air curtain and injection well.** Big Pine Key. Cost estimate \$300,000

3) **Canal #315 organic muck removal, backfilling and air curtain.** Big Pine Key. *Design only.* Cost estimate \$2,373,982.

4) **Canal #295 organic muck removal, backfilling and air curtain.** Big Pine Key. Cost estimate \$1,040,726.

5) **Canal #297 organic muck removal, backfilling and air curtain.** Big Pine Key. *Design only.* Cost estimate \$1,352,390.

6) **Canal #290 backfilling and air curtain.** Big Pine Key. *Design only.* Cost estimate \$900,000



# New Canals for FY23-24 con't.

- 7) **Canal #287 organic muck removal, backfilling and air curtain.** Big Pine Key. Design only. Cost estimate \$2,942,881
- 8) **Canal #82 organic muck removal, backfilling and air curtain.** Key Largo. Design only. Cost estimate \$2,547,229.
- 9) **Canal #474 backfill and air curtain.** Geiger Key. Cost estimate \$220,650.
- 10) **Pilot Project! Canal #278 injection well.** Big Pine Key. Cost estimate \$250,000
- 11) **Pilot Project! Canal #58 injection well.** Key Largo. Cost estimate \$250,000
- 12) **Canal #293 organic muck removal, backfill and air curtain.** Big Pine Key. Design only. Cost estimate \$2,145,335 Million. Funded by DEP Ft. Myers.



Thank you





# COMPREHENSIVE BENEFITS GUIDANCE



Comprehensive Benefits Policy Directive: January 2021. Two Key changes to our approach

## More comprehensive evaluation of all four P&G accounts:

- **NED:** National Economic Development
- **RED:** Regional Economic Development
- **OSE:** Other Social Effects
- **EQ:** Environmental Quality

## Mandatory Alternatives carried forward to the final array:

g. Each study must include, at a minimum, the following plans in the final array of alternatives for evaluation:

- (1) The “No Action” alternative.
- (2) A plan that maximizes net total benefits across all benefit categories.
- (3) A plan that maximizes net benefits consistent with the study purpose.
- (4) For flood-risk management studies, a nonstructural plan, which includes modified floodplain management practices, elevation, relocation, buyout/acquisition, dry flood proofing and wet flood proofing.
- (5) A locally preferred plan, if requested by a non-federal partner, if not one of the aforementioned plans.





# Evaluation of an Alternative





# EXAMPLES FROM EACH ACCOUNT



## NED

- Damages Prevented
- Transportation Cost Savings
- Water Supply Benefits
- Hydropower Benefits
- Emergency Cleanup cost reduction
- Incidental Recreation Benefits

## RED

- Job Created/wages supported
- Local economic impact from wages supported
- Local Tax Revenue
- Local Business Revenue
- Changes in Real Estate Value
- Net change in household income

## OSE

- Life Safety/Population at Risk
- Cost of Living
- Quality of Life
- Community Cohesion
- Voter Participation
- Civic Participation
- Community Resiliency

## EQ

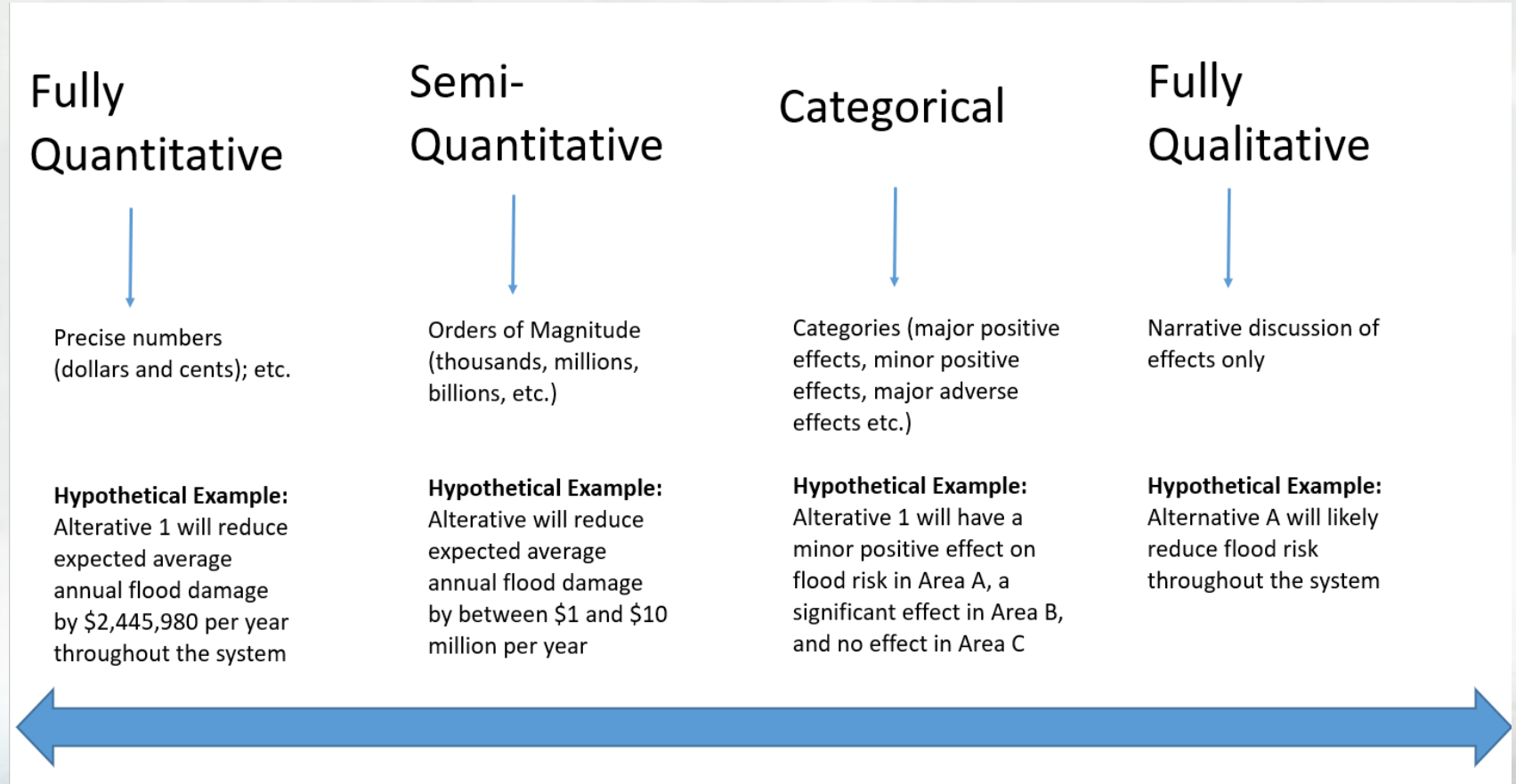
- Habitat Units
- Acres Restored
- Species Risk or Loss
- Cultural Resource Risk or Loss
- Critical Habitat created



# BENEFITS IN THE OTHER ACCOUNTS



- Monetized (\$)
- Quantified but not Monetized
- Measured but not fully quantified
- Evaluated using Directional Impacts
- Discussed qualitatively





# Challenges / Issues

---



The Directive came with:

- No additional time
- No additional money
- No additional tools
- No specific implementation Guidance! (i.e., the why but not the how).
  
- Study Scoping is More Important than Ever!
- The Alternatives Milestone is more important than Ever



# CURRENT SAJ EXAMPLES



## IRL South PAC Report

- USACE Chief of Planning (Eric Bush) did not support Director's Report without additional information about benefits in the other accounts
- Additional information was provided about benefits to tourism, recreation, water supply, and economic viability of the affected counties.
- Director's Report ultimately was signed, but the with caveat that a comprehensive "benefits update" be completed in FY23. We are starting to scope that now.





# CURRENT SAJ EXAMPLES



## Puerto Rico Coastal Feasibility Report



Ocean Park Planning Reach has economically justified alternatives (i.e.,  $BCR > 1.0$ ).

Other four Accounts still being used to evaluate alternatives



# CURRENT SAJ EXAMPLES



## Puerto Rico Coastal Feasibility Report



Rincon Planning Reach does **not** have any economically justified alternatives (i.e.,  $BCR < 1.0$ ).

Other four Accounts being used to evaluate alternatives.

Though net NED benefits are negative, the expected annual damages have a significant impact on local economic and (~40 structures are condemned in the FWOP condition, for example).

A Recommended Plan would require an NED waiver based on evaluation of all four accounts.



# DEEP DIVE: KEY TAKEAWAYS



- Application of the Comprehensive Benefits Directive is required for of USACE Planning studies.
- PDT economists are well prepared (with certified tools and methods) for NED evaluations, capabilities with respect to the other accounts are more limited. Creativity and Innovation is required.
- No national implementation guidance about **how** to do this.
- Close coordination with the vertical team and the relevant PCX (early and often) even more important than ever.
- Successful implementation also requires close coordination with the NFSponsor and affected communities.



## 7. Around the Table Updates from:

**Local,  
Tribal, and  
State Agencies**

## 8. Public Comment:

If you would like to comment, please complete Section 6 of the public comment card and give to a meeting attendant.



3:00



## 9. Closing Remarks

Carolina Maran, Ph.D., P.E., District Resiliency Officer

May 24, 2023

# Send us your Comments and Feedback

Please take a moment to send us your comments and suggestions for the upcoming meetings and share your topics of interest with us.



<https://forms.office.com/g/4X2kHNe1dj>

# 10. Adjourn

**Thank you for  
joining !**

