

District Resiliency Initiatives Sea Level Rise and Flood Resiliency Plan

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FLOOD CONTROL: Central & Southern Florida Project



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SOUTH FLORIDA WATER MANAGEMENT DISTRICT Evapotranspiration Levee Drainage Canal Waterflow Water Conservation Areas Wellfield Wellfield RAINFAL Saltwater **Engineering-RUN OFF Designed Systems** Source: Broward County TRANSPIRATION Lake Groundwater Spring Wetlan **OUR WATER EVAPORATION** Estuary MANAGEMENT Aquifer System Saltwater **SYSTEM & CHANGING CONDITIONS** Source: Florida Center for **Natural Systems** Instructional Technology -3 University of South Florida

Climate Change Observations



Climate Change Projections

SEA LEVEL RISE

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MORE EXTREME RAINFALL

Future Rainfall Change Factors 100-yr 3-day Duration - Median and 50% Confidence Interval



HIGHER GROUNDWATER

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Limitations in Operation Water Management & Flood Vulnerability



Learn more about how sea level rise and other climate change impacts are affecting water resources management and flood protection in South Florida:

https://vimeo.com/4160903 81/a11cead328

Water and Climate Resiliency Metrics Making Informed Decisions



Observed Long Term Trends

Access data analysis to support your vulnerability assessment at:

Water and Climate Resilience Metrics (sfwmd.gov)

Fidal Elevations Estuarine Inland Migration gh Tide Elevations Soil Subsidence Itwater Interfac Salinity MFLS ECOSYSTEM **Groundwater Elevations** Water Temperature **Evapotranspiration Dissolved** Oxy Rainfall pН **Flooding Events** Specific conductance HYDROLDGY

Resilience Metrics Hub

Water and Climate Resilience Metrics

Q Search...

The South Florida Water Management District is strongly committed to addressing the impacts of sea level rise and a changing climate. The District's resilience efforts support its mission of safeguarding and restoring South Florida's water resources and ecosystems, protecting communities from flooding, and ensuring we are able to meet South Florida's water needs while connecting with the public and stakeholders.

Objectives

As part of a series of District Resiliency initiatives to address changing conditions, the District is implementing a set of water and climate resilience metrics districtwide. These science-based metrics are being developed with the goal of tracking and documenting shifts and trends in District-managed water and climate observed data, supporting the assessment of current and future climate condition scenarios and related operational decisions, and informing District resiliency investment priorities. As part of the District's communication and public engagement priorities, this effort informs stakeholders, the general public, and partner agencies about the District's resilience efforts, while supporting local resiliency strategies. This Hub hosts the latest Water and Climate Resilience Metrics information and data analysis results, as well as related information that is relevant to the context of each metric discussion.

This page was designed as a living data hub and will be modified and updated as necessary. Check back frequently for updated data and resilience information.

FLORIDA WATER MANAGEMENT ѕоитн DISTRICT



Regional Rainfall

Changes in rainfall patterns will impact people and ecosystems by altering the amount of water in our region throughout t...



Elevations at Coastal Structures and Sea Level Rise

Tailwater and headwater elevations at coastal structures represent how sea level rise affects stormwater discharge capacity in South...



Saltwater Intrusion in Coastal Aquifers

The inland migration of saltwater poses a threat to water supply and critical freshwater habitats.



SFWMD Data and Support

DBHYDR



Salinity in the Everglades

The salinization of previously freshwater systems poses threats to several factors.



Estuarine and Mangrove Inland Migration Trends in Estuarine Inland Migration provide insights to the impacts of sea level rise in coastal areas and the Everglades.



Soil Subsidence in South Florida

Maintaining soil elevations within coastal and intertidal habitats, as sea level changes, is an indicator of long-term stability of coastal.



coastal communities and habitats for the effects of

Details View

climate change, es rising sea levels.

USGS Water

Details

This website is designed to

and graphical analyses on

onduct automated statistica

and graphical analyses on water-level and salinity data collected from sites monitored by the U.S. Geological Survey (USGS) in South Florida

Mapper



Federal and State Agencies' Information





SFWMD SFER 2021 As the South Florida Water Manageme

timely and authoritative scientific data and information about climate science, adaptation, and mitiga Dotails Explore



Northeastern Florida Bay Soil Subsidence





la s

Non-Flooded Sites - TS-1and TS-2 Elev. Change 1.6 mm/yr



Frequently Flooded - TS-3 Elev. Change 3.7 mm/yr



Frequently Flooded - TS-4 Elev. Change 3.7 mm/yr



Frequently Flooded - TS-8 Elev. Change 3.7 mm/yr



Frequently Flooded - TS-10 Elev. Change 3.7 mm/yr



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Resilience Metrics Hub From Observations to Projections



Resilience Metrics Hub



Future Outlook in Regional Resiliency

Future Extreme Rainfall Change Factors for Flood Resiliency Planning in South Florida

This tool provides access to future extreme rainfall change factors for resiliency planning for the 16 counties and 14 rainfall areas within SFWMD boundaries, as well as the Everglades National Park rainfall area, and an additional combined rainfall area for the Florida Keys and Biscayne Bay.

DBHYDR DBHydro Insights

DBHydro Insights

DBHYDRO is the South Florida Water Management District's corporate environmental database that stores hydrologic, meteorologic, hydrogeologic and water quality data.





SFWMD GIS Open Data Hub

SFWMD GIS Hub

Our Open Data site is where our publicly

available spatial datasets can be viewed and downloaded. Additional Web Apps and Story Maps are featured to explore and learn more about the data. Details

<u>View</u>



As the South Florida Water Management District works to Achieve More Now For Florida's Environment, we are pleased to present the 2021 South Florida Environmental Report (SFER).

Details <u>View</u>

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Future Extreme Rainfall Projections

Future Extreme Rainfall Change Factors for Flood Resiliency Planning in South Florida | Resiliency Metrics Hub (arcgis.com)



Future Extreme Rainfall Projections



Future Extreme Rainfall Projections

https://apps.sfwmd.gov/sfwmd/gsdocs/TPubs/2022 SFWMD TM Adoption of Future Extreme Rainfall Change Facotrs for Resiliency Planning in South Florida.pdf





ACKNOWLEDGMENTS

This technical memoranham was made possible by the guidance, support, and contributions of a dedicated mass of advisibule at the foods Fireda Ware Management Direttor, United States Geological Starrey, and United States Area Coups of Disperses. We would also to expectably advantage the wolksoid Beelback percented by the United States Geological Starry Cardback Testisk Ware Science Course and Filmida ternational University Sea Lovel Soliations Center, and express our approxiation to the Patter Extreme Ranfal Projections Technical Workgroup-members who assured with the propagators of the assurementant as foliones.

PROJECT TEAM

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Future Extreme Rainfall Projections – USGS Data Release

https://doi.org/10.5066/P935WRTG



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Resiliency Needs and Opportunities

Urgency to address the vulnerability of the C&SF Flood Control Project and Big Cypress
Identification of Priority Projects in coordination with water managers
Identification of Funding Sources to accelerate implementation



Historic and Largest Florida Flooding and Sea Level Rise Resilience Initiative

- SB 1954: Resilient Florida Program
- Over \$697 million available to support efforts to ensure state and local communities are prepared to deal with the impacts of sea level rise, intensified storms and flooding



Our Resiliency Vision

Risk Reduction / Effectiveness

Implementation Resources

Anticipated Future Conditions

Population and Critical Infrastructure Impacted

Public Engagement and Leveraging Partnerships

Ongoing Ecosystem Restoration Efforts

Innovative Green/Nature-Based Solutions



SOUTH FLORIDA WATER MANAGEMENT DISTRICT SEA LEVEL RISE AND FLOOD RESILIENCY PLAN



FPLOS Phase III / C&SF Flood Resiliency Study

Presenter: Carolina Maran

Draft

Version 2.2

September 2021

Flood Protection Level of Service Program

From Data Analysis to Robust H&H Modeling Assessments

Critical District's strategy for assessing and addressing the impacts of development and climate change on flood control

- Evaluate current and future flood risk in the canal system and communities basinwide
 - Considers rainfall, tide, storm surge and sea level rise

Support decision making on prioritizing investment for improvements and adaptation

www.sfwmd.gov/our-work/flood-protection-level-service



SFWMD – FIAT Tool

- Combines exposure data and flood maps with damage curves to calculate the flood damages and risk per object
- Developed to run quick, consistent, and well-founded flood damage risk calculations
- Supports underpinning the benefits of flood mitigation and adaptation measures when recommending priority infrastructure investments

Public Workshop – May 31st



Translating hydrodynamic model results into economic risk assessments. Source: Taylor Engineering South Florida Water Management District Flood Impact Assessment Tool User Manual





USA

Priority Projects: Coastal Structures Resiliency

- Cost Estimates advanced for the most vulnerable Coastal Structures and organized by:
 - Immediate Needs (FY22-FY25)
 - Short Term /Near Term Needs (FY25-FY28)
 - Intermediate Term Needs (FY28-FY31)
 - Long Term Needs (FY31-FY34)
- Initial recommendations for refurbishment vs. replacement of coastal structures, along with forward pump addition, to restore design discharge

Likelihood of Failure	Overbank Flooding	
	Finished Flood Elevation	
	Storm Surge / SLR Vulnerability	
	FPLOS Phase I Deficiency	
	FPLOS Phase II Recommendation	
	Known Chronic Flooding	
Consequence of Failure	Population	
	Adaptation Action Areas	
	Financially Disadvantage Areas	
	Public Water Supply Wellfields	
	Critical Assets / Lifeline	



Coastal Structures Resiliency – Projects Scope

- Improved pump capacity for existing Infrastructure at critical locations
- Flood barriers and structure elevation
- Additional backup and redundancy for existing and new infrastructure
- Land and Real Estate needs for enhancements

Adaptation Planning: pump capacity can be increased with time, through a phasing approach



Lead P.E.: Jill Skags, Lead Inspector SFWMD Underwater P.E.: Jeffrey O'Connor, Underwater Checklist Underwater Engineering Services Inc. Sep 30 2020 15:10:02

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S29 Coastal Structure Resiliency

Benefiting Broward & Miami Dade Counties

- C9 Basin: fully developed, primarily residential and commercial uses, 450K people, 100 square miles
- Hardening of Coastal Structure (elevating gates and other equipment)
- Forward pump (2000cfs) and back up generator
- Flood Barrier (tie back to higher land)
- Real Estate Needs
- Currently in Design





Hydrology and Hydraulics Bureau



S27 Coastal Structure Resiliency

Benefiting Miami Dade County

- C7 Basin: fully developed, primarily residential & commercial uses, 275K people, 32 square miles
- Hardening of Coastal Structure (elevating gates and other equipment)
- Forward pump (1400cfs) and back up generator
- > Flood Barrier (tie back to higher land)
- Real Estate Needs
- Currently in Design
- RFI Associated WQ Technology



Self-Preservation Mode in Critical Structures

- Start with "self-preservation lockdown" system for the maximum number of critical structures
- Goal: maximize ability to operate gate during storm surge events, addressing Hurricane Irma/Matthew/Dorian structure lockouts
- ➢ Risk already reflected in the newest FEMA Coastal A Zone Maps
- ➢ Focus on the electronic/mechanical components, generators
- Impractical to protect/elevate all structures to Cat 5 surge; balance between how high to elevate according to life expectancy

Additional Programing; storm resilient Back Up Controller instrument and platform Install Backup Controller and other automation features Modify gates for added high tide protection against reverse flow

Modify Structure by adding seals Add Backup generator and other automation needs





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Corbett Levee

- Tropical Storm Isaac brought unprecedented rainfall to areas of central Palm Beach County resulting in widespread flooding
- Corbett Levee: area of critical concern for berm failure due to localized slope failures, excessive seepage, and the formation of boils (seepage pathways).
- Levee strengthening to meet current USACE and SFWMD standards and to increase the level of flood protection
- Initial Construction: 2.6 miles of levee to the east of the ITID Reservoir
- \$9.3M estimated to complete the final section of the levee, around 3 miles



South Dade Curtain Wall

- Comprehensive flood protection strategy for Miami Dade County
- Build resilience by providing flexibility to manage high water conditions in WCA-3A
- > Beneficial both for flood control and achieving restoration goals
- Future phase(s) to address the full length of the needed seepage barrier (beyond the 8.5 SMA curtain wall, as approved by the GB)
- > Broad support from private, local, state and federal stakeholders





Everglades Mangrove Migration Assessment Pilot Study

- Demonstration-scale pilot study: ecological vulnerabilities to SLR
- Nature-based solution to increase coastal mangrove elevation and minimize saltwater intrusion, peat collapse and land loss
- Increase adaptive capacity of Florida's coastal wetlands, keep up with SLR and provide flood protection in upland areas
- Results are applicable to areas throughout the Gulf and Atlantic Coasts of Florida
- Preservation, enhancement and restoration of mangrove and other vegetative communities will build coastal resiliency, reduce storm surge damage, and create habitat for a large variety of fish and wildlife species



Planning Projects: FPLOS Phase I and Phase II Recurring Funding Needs



Planning Projects: Data Needs

- Water and Climate Resiliency Metrics Web Tool Implementation
- Future Conditions Groundwater Modeling Water Supply Vulnerability Assessment & Saltwater Interface Mapping
- Hydrometeorological Data Monitoring
- Statewide Regional Climate Model
- Flooding Events Mapping and Database Tool
- Green Infrastructure Flood Mitigation Strategies -Associating Water Quality Benefits at C7 (Little River) Basin



Project Plan Document & Next Steps

- Continuous formulation process (yearly by Sept 1st and October 1st – upon HB513/2022 execution)
- New Content:
 - Nature-Based Solutions
 - Renewable Energy offset
 - Water Supply
 - Link to ongoing Restoration efforts
 - Cost Benefit Analysis (SFWMD FIAT Tool)
- Incorporation of FPLOS Phase II Recommendations + Local Projects, based on expanded ranking criteria
- Comments: Public Workshop on June 14th, 2022
- Leverage additional funding opportunities

SOUTH FLORIDA WATER MANAGEMENT DISTRICT SEA LEVEL RISE AND FLOOD RESILIENCY PLAN



Integrating Local, Regional, Natural, Inland Drainage and Coastal Flood Resiliency Strategies



POTENTIAL MEASURES TO IMPROVE RESILIENCE AND SUSTAINABILITY

Graphic modified from https://ewn.el.erdc.dren.mil/nnbf/other/5_ERDC-NNBF_Brochure.pdf



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C&SF Flood Resiliency Plan

- March 2020: Local Project Sponsor, approved by SFWMD Governing Board
- C&SF Review Study due to changed physical conditions
- To be conducted under Section 216 of the Flood Control Act of 1970
- Initial Appraisal Report approved by Jacksonville and South Atlantic Division Offices (phased approach)
- New Start at the 2022 Budget (\$500K) Cost-Share Agreement Under Review (June 2022)

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



Thanks!

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Greater Fort Lauderdale Convention & Visitors Bureau