

SOUTH FLORIDA WATER MANAGEMENT DISTRICT



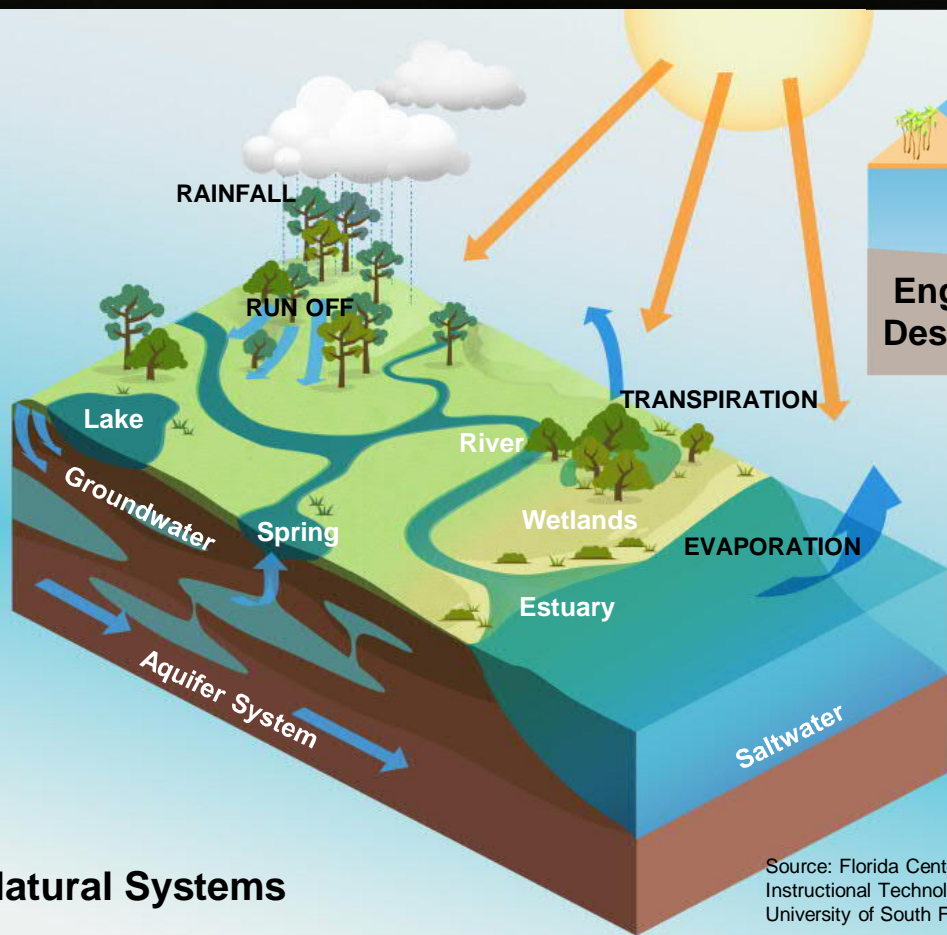
SFWMD Resilience Efforts Sea Level Rise and Flood Resiliency Plan & C&SF Study

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

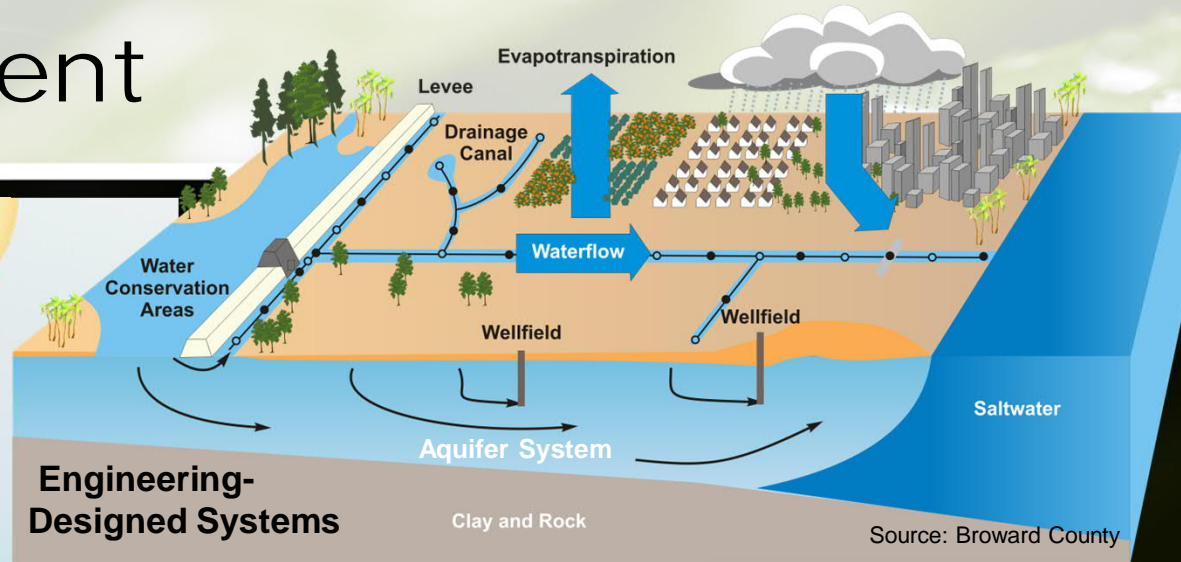
February 14, 2023

sfwmd.gov

Water Management



Natural Systems



Engineering-Designed Systems

Safeguard and restore water resources & ecosystems

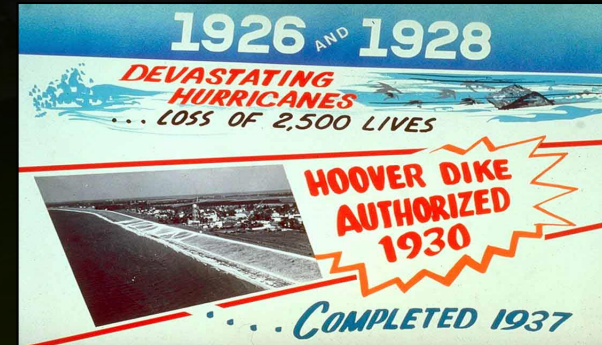
Meet the region's water needs

Protect our communities from flooding

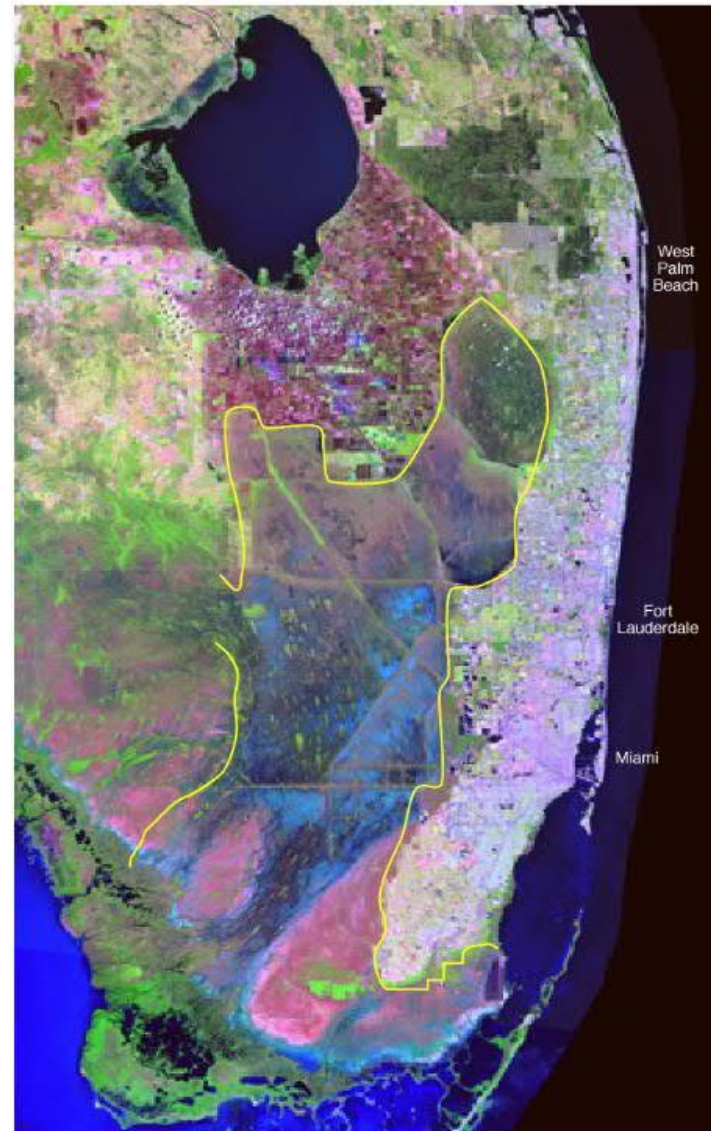
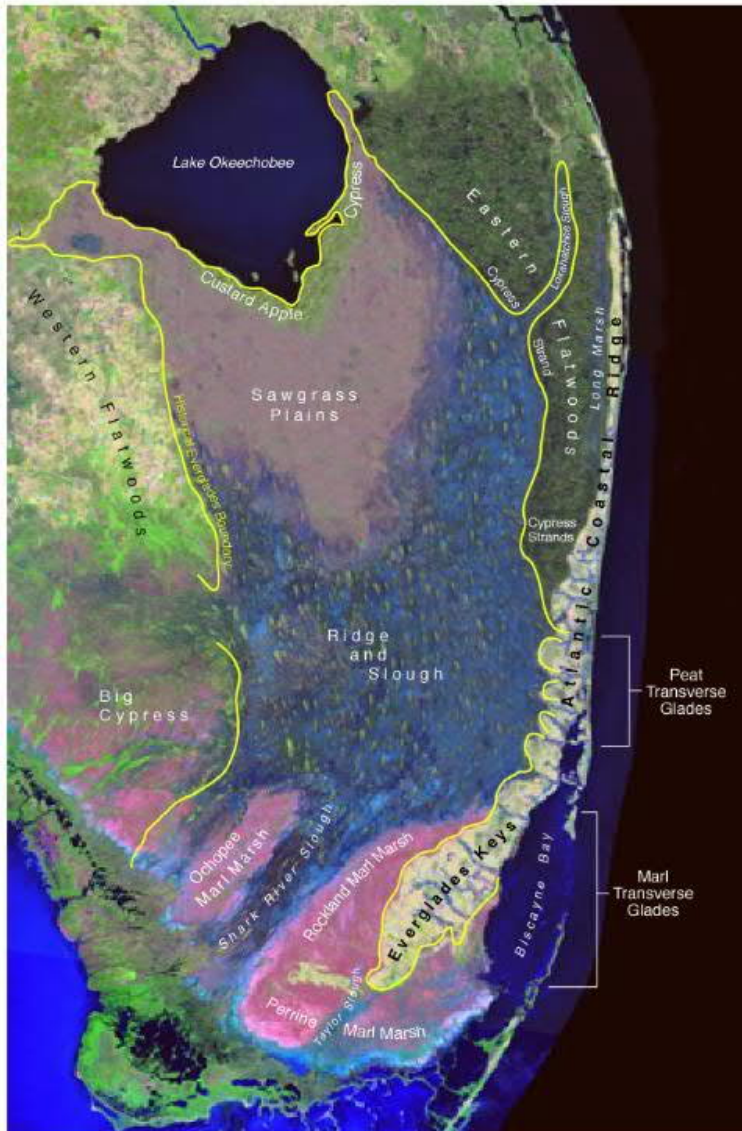
FLOOD CONTROL: Central & Southern Florida Project



ANNUAL REPORT
OF
FLOOD DAMAGE
IN THE
FLORIDA INTERCOASTAL
DRAINAGE DISTRICT
1927



SOUTH FLORIDA WATER MANAGEMENT DISTRICT



'Save Everglades' Stand Draws Praise for Graham

TALLAHASSEE (UPI) — The Florida Audubon Society says Gov. Bob Graham's "Save Our Everglades" program is an historic reversal of the philosophy over the years that the environment had to be sacrificed for growth.

"This is a day to mark in the history books," Audubon president Peter Mott said after Graham's proposals were outlined Tuesday. "This is a day when a Florida governor has decided to reverse the destructive trends that have threatened the Everglades."

Mott said Graham should expect opposition from "powerful interests that would like to see the drainage and development of the Everglades continue for private gain."

The governor's program is intended to protect and restore the Everglades from the Kissimmee River to the Ten Thousand Islands in Florida Bay.

It is patterned after Graham's earlier "Save Our Coasts" and "Save Our Rivers" initiatives and attempts to bring together many continuing Everglades programs, including de-channelization of the Kissimmee, as well as stimulate new efforts.

"We must save our Everglades. We must stop



GRAHAM GESTURES DURING TUESDAY NEWS CONFERENCE ...governor points to areas of attention in 'Save Our Everglades' plan.

Everglades of the year 2000 should look more like the Everglades of the year 1900 than the Everglades of today. We will attempt in the next 17 years to heal the damage inflicted over the past century."

The powers of government will be concentrated on halting further destruction of the Everglades, restoring as much as possible of the already ravaged land, and improving the overall management of the region.

Graham's program in- g ef- \$17.5 0,000 s ap- t last of the

Kissimmee, which has been under study for years and has become highly controversial; and restoration of the Holy Land and Rotenberger tracts in the Everglades Agricultural Area in Palm Beach County.

It also includes management of the deer herd in Water Conservation Area 3 in Dade at a lower population so the animals can better survive high water levels; changes in Alligator Alley and the Tamiami Trail as they are upgraded to become part of I-75 to eliminate interference in the Everglades' natural water flow; restoration of Everglades National Park under a plan proposed by

park superintendent John Morehead; and greater efforts to protect the nearly extinct Florida panther.

Graham said he will appoint a committee to work with the Game and Fresh Water Fish Commission in trying to protect the panther and other panels to study the Kissimmee River Basin and East Everglades and possibly propose area of critical state concern designations.

He said he wrote President Reagan on Monday asking for the appointment of a special official to coordinate all programs affecting the Everglades and he appealed Tuesday for the full support of local and regional governments.

S. Florida water board overhauled

Graham ousts four to save Everglades

By RANDY LOFTIS And MICHAEL OLLOVE Herald Staff Writers

TALLAHASSEE — Saying South Florida's future was at stake, Gov. Bob Graham on Friday sacked four members of the South Florida Water Management District's nine-member governing board and replaced them with recruits in a campaign to "save our Everglades."

Graham announced replacements for three of the four and said the fourth replacement still is being sought.

All the replacements have "strong and dedicated" commitments to restoring the Everglades and controlling South Florida growth, Graham said in a press release.

Graham's announcement was the opening salvo in what might be one of the most sweeping environmental reforms in Florida history. The governor used the appointments to demonstrate that he wants major changes in the way South Florida looks at water, growth and development.

Named to four-year terms were Kathleen Abrams, 41, of Miami Shores, a South Florida Regional Planning Council member considered a strong environmentalist; John F. Flanigan, 43, a North Palm Beach lawyer with past service on state hospital planning boards; and Timmer E. Powers, 46, of Indian-town, a former Martin County commissioner who helped write that county's environmental protection rules.

Graham receives praise for Everglades program

By Linda Kleindienst Capital Bureau

TALLAHASSEE — Gov. Bob Graham's actions to restore the Everglades to its natural condition should be put in the history books, says Charles Lee, vice president of the Florida Audubon Society.

"We're talking about taking an ecosystem which has been degraded, turning it around and putting it back into its natural productive state," Lee said Tuesday after Graham released details of his Save Our Everglades program.

Marjorie Stoneman Douglas, a 93-year-old Miami resident who wrote the 1947 classic, *Everglades River of Grass*, and was instrumental in formation of Everglades National Park, explained that she had not yet examined Graham's proposal.

But she added, "As far as I know it's a very good idea. I don't have anything to say against it. Anything he does is taking a great step forward."

Graham officially launched the Everglades restoration campaign Tuesday but predicted the state may run into some resistance.

"We're not going to adopt a policy that says we're going to reverse the mistakes of the past century without controversy."

The program was immediately applauded by environmentalists such, but they also suggested major resistance may come from developers who still hope to encroach on the Everglades.

"There are powerful interests that would like to see the drainage and development of the Everglades continue for private gain," warned Audubon Society President Peter Mott.



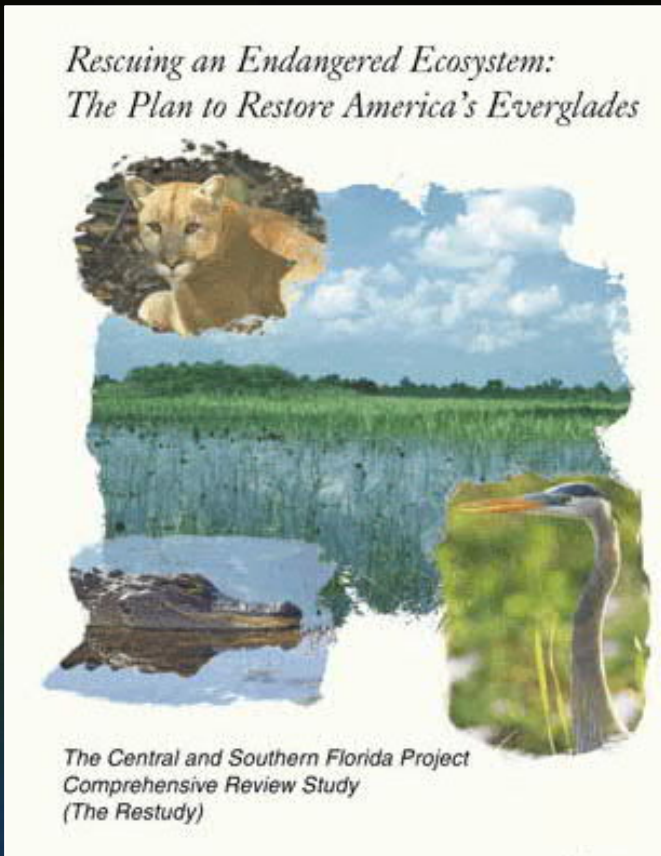
Staff map by LARRY GEYMAN

Key areas for restoration are located by circles.

Slide Credits:

Audubon | FLORIDA Charles Lee, Director of Advocacy

Comprehensive Review Study



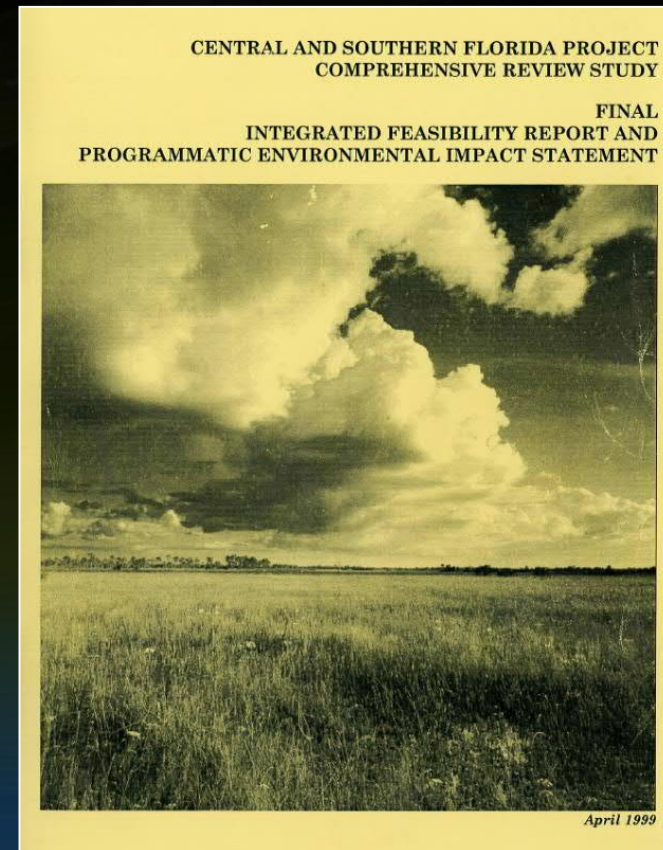
Central and Southern
Florida Project (C&SF)
Restudy – WRDA 1992

Reconnaissance
Report by USACE -
1994

Governor's Commission for Sustainable
South Florida develops Conceptual Plan –
1996

Comprehensive
Review Study by
USACE - 1999

CERP authorized
by Congress - 2000



Everglades Restoration

Goal 1

Get the Water Right

Goal 2

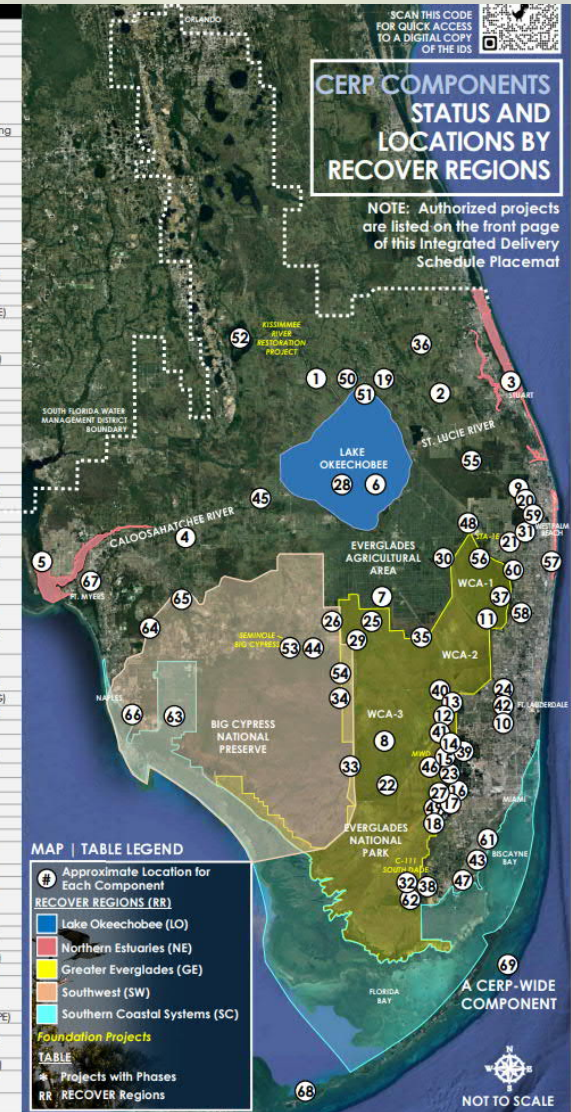
Restore, Preserve, and Protect Natural Habitats and Species

Goal 3

Foster Compatibility of the Built & Natural Systems

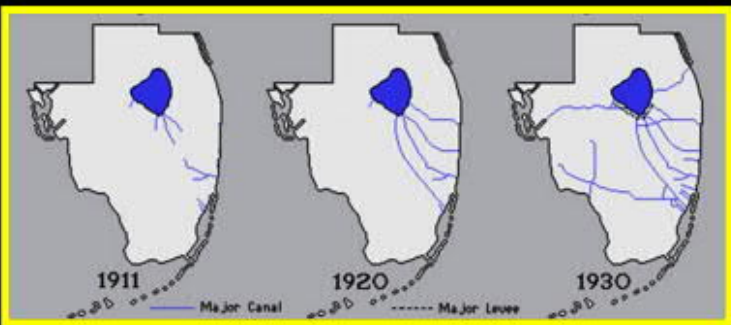
Source: Jacksonville District > Missions > Environmental > Ecosystem Restoration > Integrated Delivery Schedule (army.mil)

#	RR	YELLOW BOOK NAME AND CODE
10	SC	Change Coastal Wetland Operators (L)
11	GE	Site 1 Impoundment with ASR* (M)
16	GE	C-4 Structures (I)
19	LO	Taylor Creek/Nubbin Slough Storage and Treatment Area* (W)
25	GE	Modified Holy Land Wildlife Management Area Water Management Operations (DD)
26	SW	Modified Rotenberg Wildlife Management Area Water Management Operations (EE)
38	SC	C-111 Spreader Canal* (WW) - Phase 2 in Planning
42	GE	Lower East Coast Water Conservation (AAA)
48	GE	C-51* and Southern L-8 Reservoir (GGC)
50	LO	Lake Okeechobee Watershed Water Quality Treatment Facilities* (OPE)
56	GE	Acme Basin B (OPE)
57	NE	Lake Worth Lagoon Restoration* (OPE)
58	GE	Windsong Farms Wetlands Restoration (OPE)
60	GE	Protect and Enhance Existing Wetlands Systems along Lox (Strazulla Tract) (OPE)
64	SW	Southern GREW Project Addition (OPE)
65	SW	Lake Trafford Restoration (OPE)
66	SW	Henderson Creek/Belle Meade Restoration (OPE)
67	GE	Lake Park Restoration (OPE)
68	SC	Florida Keys Tidal Restoration (OPE)
69	ALL	Melaleuca Eradication and Other Exotic Plants (OPE)
2	NE	St. Lucie/C-44 Basin Storage Reservoir (R)
3	NE	Environmental Water Supply Deliveries to St. Lucie Estuary (C)
4	NE	Caloosahatchee Basin Storage Reservoir with ASR* (D)
5	NE	Environmental Water Supply Deliveries to Caloosahatchee Estuary (E)
7	GE	EAA Storage Reservoir (G)
8	GE	Everglades Rain-Driven Operations* (H)
9	GE	L-8 Project (K)
12	GE	Water Conservation Area 3A and 3B Levee Seepage Management (O)
13	GE	Western C-11 Diversion Impoundment and Diversion Canal (Q)
14	GE	C-9 Stormwater Treatment Area/Impoundment (R)
18	GE	L-31M Improvements for Seepage Management (V)
22	GE	Additional S-34S Structures* (A*)
27	GE	Construction of S-35A and B Structures* (FF)
29	GE	Pump Station G-404 Modification (I)
32	SC	Modification to SDCS in southern portion of L-31N and C-111 (OO)
33	SW	Decomartmentalization of Water Conservation Area 3* (QQ)
36	NE	C-23, C-24, C-25 and Northfork and Southfork Bains Storage Reservoir (UU)
55	GE	Pai Mar and J.W. Corbett Wildlife Management Area Hydropattern Restoration (OPE)
61	SC	Biscayne Bay Coastal Wetlands* (OPE) - Phase 2 in Planning
63	SW	Southern Golden Gate Estates Hydrologic Restoration (OPE)
1	LO	North of Lake Okeechobee Storage Reservoir (A)
28	LO	Lake Okeechobee Aquifer Storage and Recovery* (GG)
34	SW	Flow to Central Water Conservation Area 3A (RR)
39	GE	North Lake Bell Storage Area (XX)
43	GE	South Miami Dade County Reuse (BBB)
44	SW	Big Cypress/L-28 Interceptor Modification (CCC)
47	SC	Biscayne Bay Coastal Canals (FFF)
49	SC	West Miami Dade Reuse (HHH)
6	LO NE	Lake Okeechobee Regulation Schedule* (F)
15	GE	Central Lakebell Storage Area (S)
17	GE	Bad Drive Recharge Basin (U)
20	GE	C-17 Backpumping (K)
21	GE	C-51 Backpumping to West Palm Beach Water Catchment Area (Y)
23	GE	Dade Broward Levees/Pennsua Wetlands (BB)
24	GE	Broward County Secondary Canal System (CC)
30	GE	Loxahatchee National Wildlife Refuge Internal Canal Structures (KK)
31	GE	C-51 Regional Groundwater ASR (LL)
37	GE	Palm Beach County Agricultural Reserve Reservoir (VV)
40	GE	Divert WCA2 flows to Central Lake Bell Storage (YY)
41	GE	Divert WCA3 flows to Central Lake Bell Storage Area (ZZ)
45	NE	Caloosahatchee Backpumping with STA (DDD)
46	GE	Flows to Eastern Water Conservation Area (EEE)
51	LO	Lake Okeechobee Tributary Sediment Dredging/Phosphorus Removal (OPE)
52	LO	Lake Okeechobee Regulation Schedule Modification (OPE)
54	SW	Miccosukee Water Management Plan (OPE)
62	SC	Restoration of Pineland & Hardwood Hammocks in C-111 Basin (OPE)
35	SC	Re-route Miami-Dade Water Supply Deliveries (SS)
53	SW	Seminole Tribe Big Cypress Water Conservation Plan (East and West) (OPE)
59	GE	Palm Beach County Wetlands-based Water Reclamation (OPE)



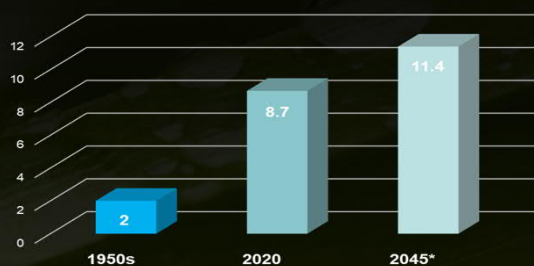
Recognizing Changed Conditions

Pre-1948 Drainage Projects

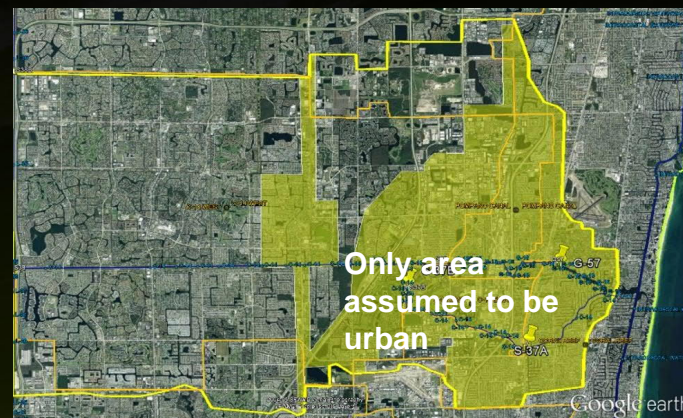


POPULATION GROWTH

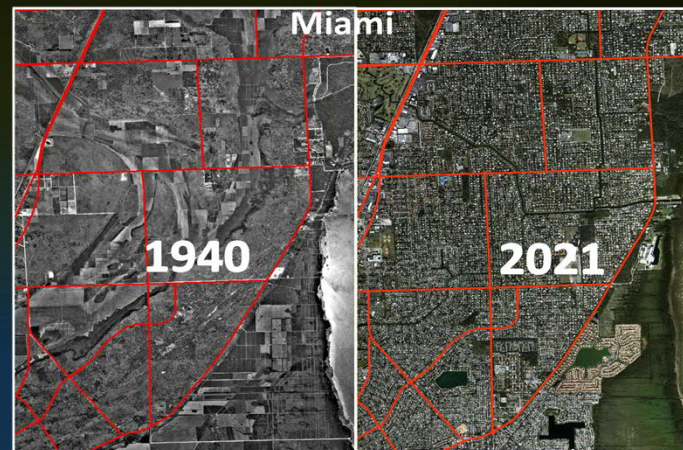
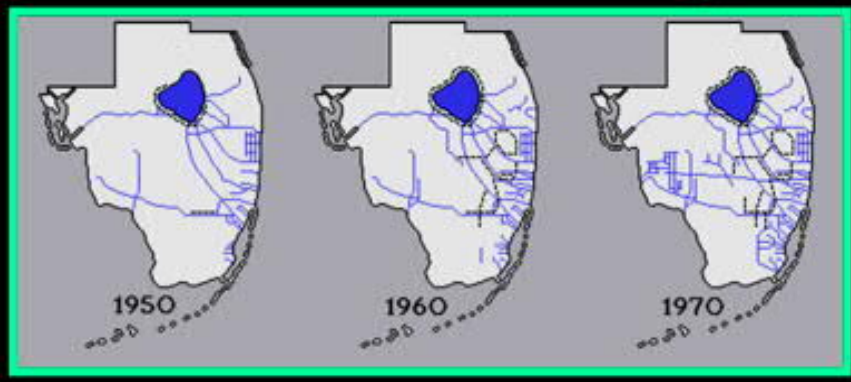
Population (million)



* Estimate taken from BEBR 2017 publication (Median, SFWMD boundaries)



Post-1948 C & S Florida Project

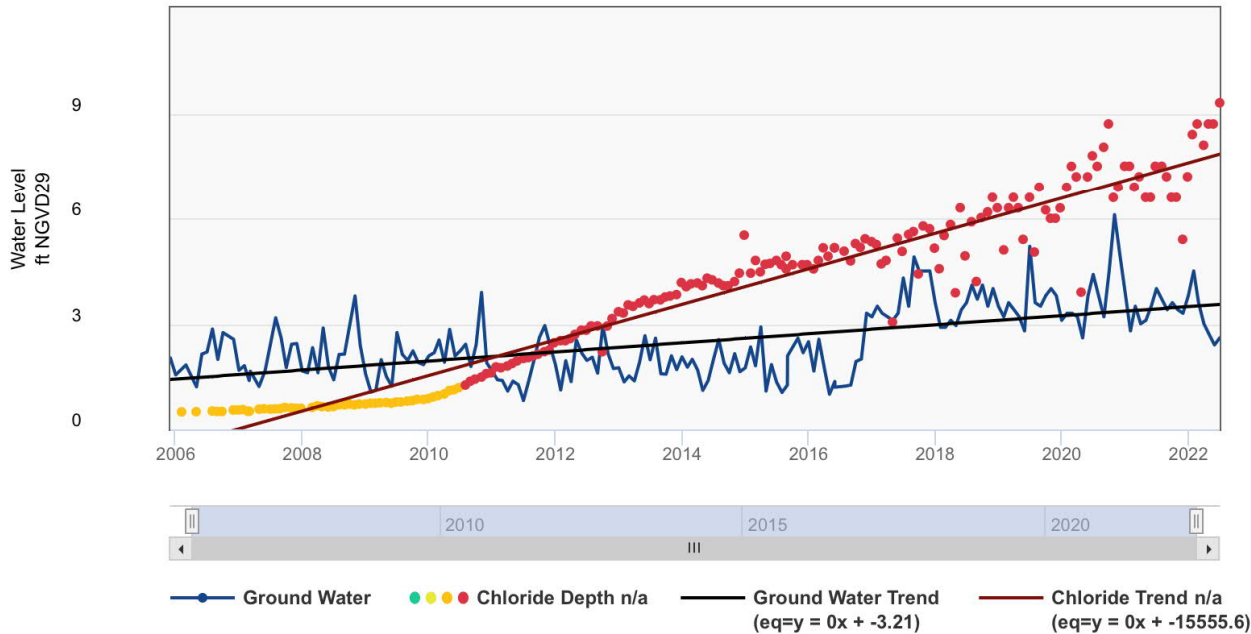


Recognizing Changed Conditions: Emerging Trends in Regional Resiliency

HALLANDALE

As of Thursday, July 28, 2022 at 7:00:49 PM GMT-04:00

Zoom 6m 1y **All**



DBHYDR
insights

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

[Details](#) [View](#)

SFWMD Data and Support

Regional Geographic Information System (RGIS)

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 View Maps and Story Maps are featured to explore and learn more about the data.

[Details](#) [View](#)

SFWMD 2022 2021

SFWMD SFER 2021

As the South Florida Water Management District works to Achieve More from Florida's Environment, we're pleased to present the 2021 South Florida Environmental Report (SEER).

[Details](#) [View](#)

BROWARD COUNTY
IDA

Resiliency

Local Agencies are using their resources to help us understand the potential risks that come with Coastal Resiliency efforts.

[Main Page](#)

Local Agencies' Information

Miami-Dade County Sea Level Rise Strategy

Miami-Dade County faces an unprecedented dual surge in the coming decades to adapt to climate change and sea level rise.

[Details](#) [Main Page](#)

Palm Beach County Office of Resilience

The Office of Resilience (OOR) works to ensure that Palm Beach County remains a great place to live, work, and play while addressing physical, social, and economic challenges including climate change.

[Details](#) [Main Page](#)

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

FDEP

[Florida Resilience Coastal Resilience Program](#)

The Florida Department of Environmental Protection is committed to maintaining resources to prepare Florida's coastal communities and facilities for the effects of climate change, especially rising sea levels.

[Details](#) [View](#)

NOAA Resilience HUB

This page is a hub for NOAA-related resilience resources. Here you can access the agency's resiliency assets, explore ELP-funded resilience projects, and learn more about our grassie community. The F.I.N. Community Resilience Education Theory of Change can also be found on this hub.

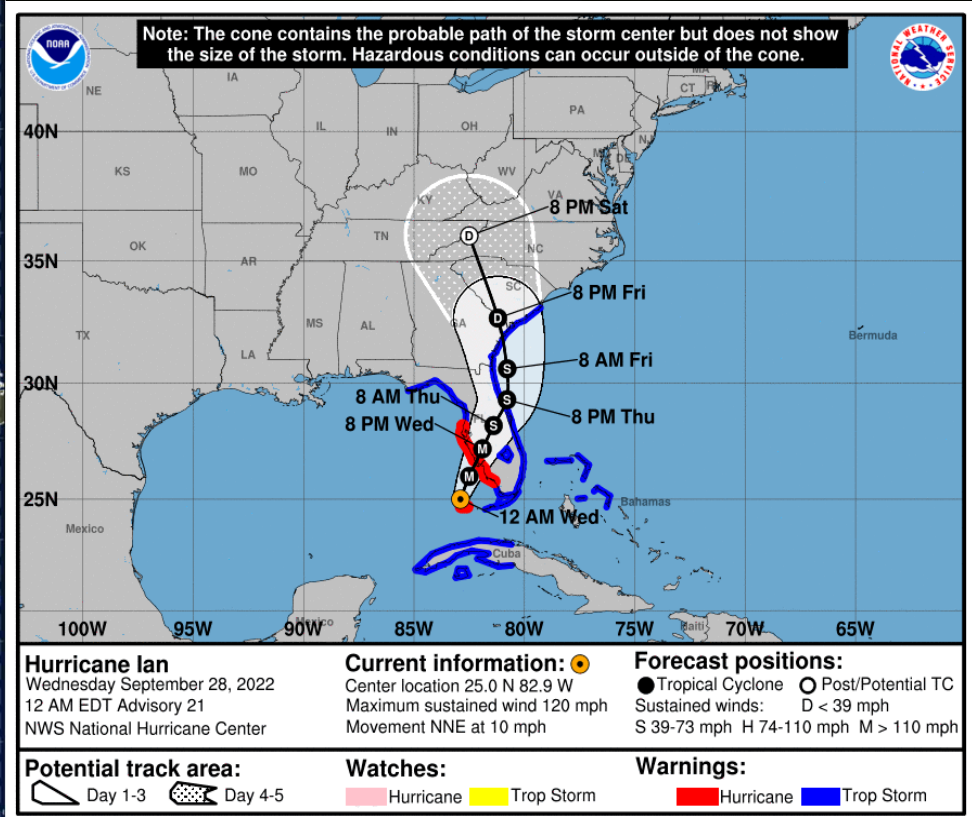
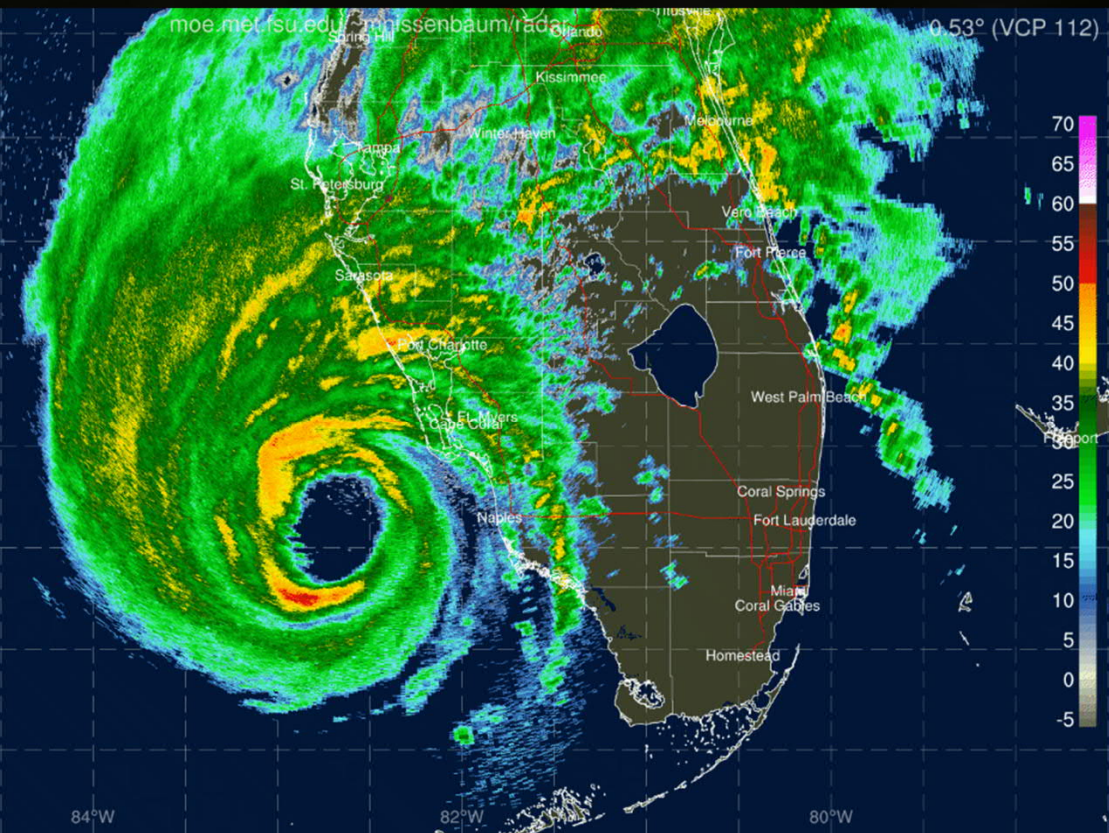
[Details](#) [View](#)

NOAA Global Climate Dashboard

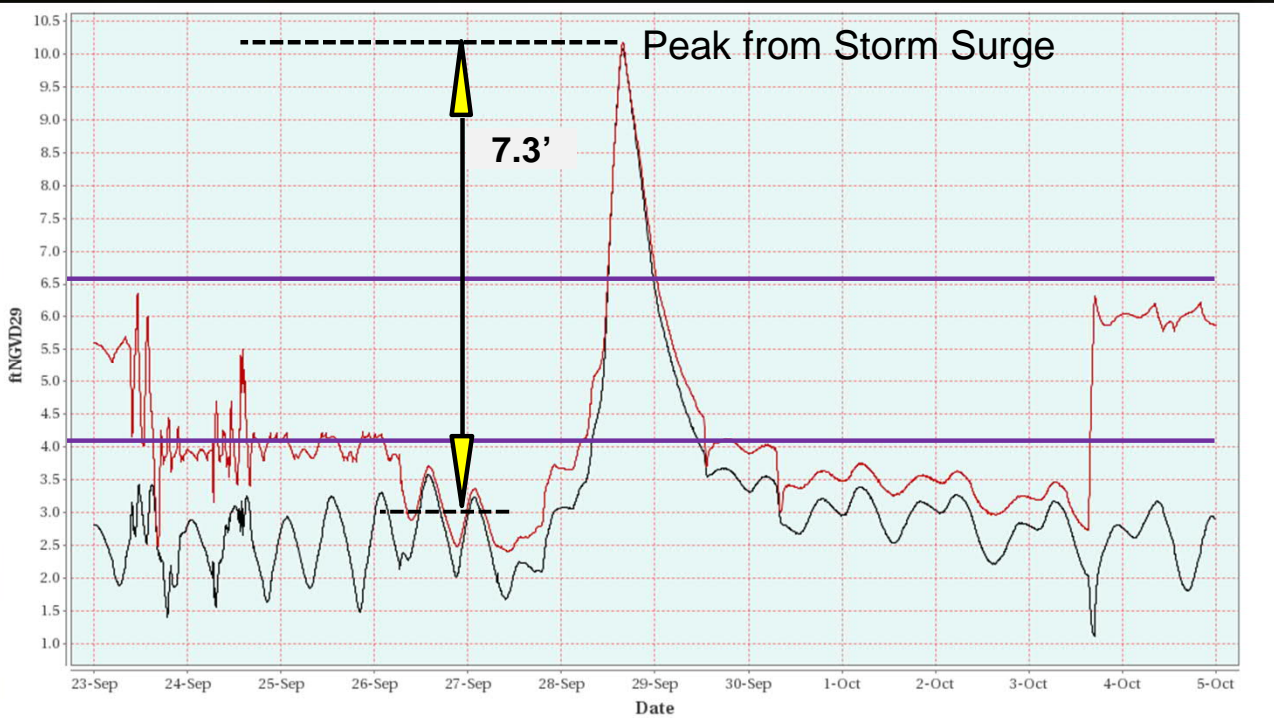
NOAA Climate.gov provides timely and authoritative scientific data and information about climate science, adaptation, and mitigation.

[Details](#) [Explore](#)

Hurricane Ian, September 28, 2022



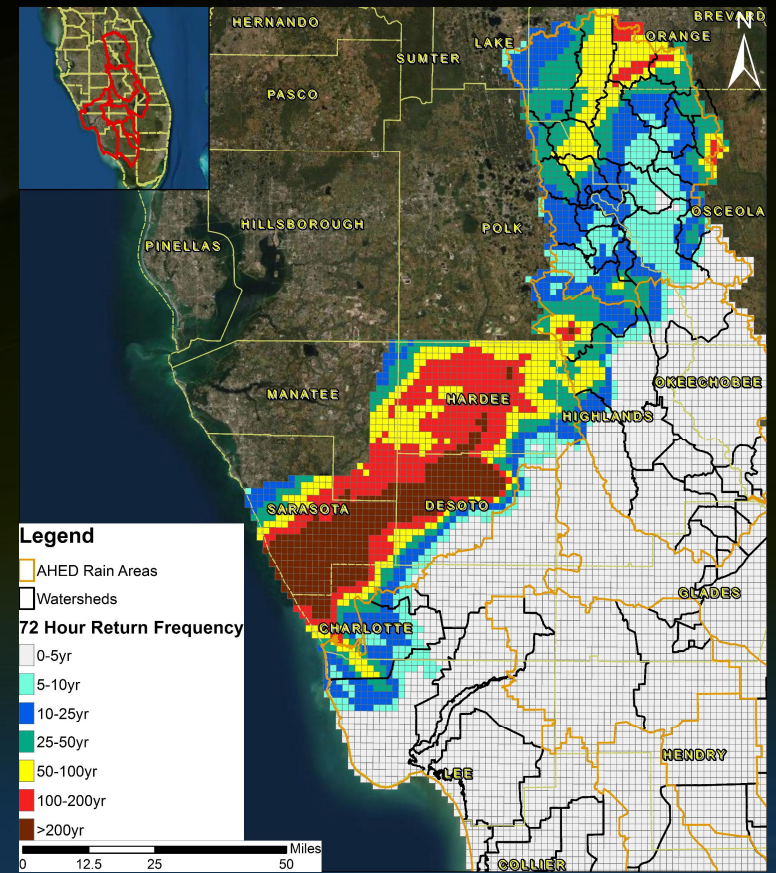
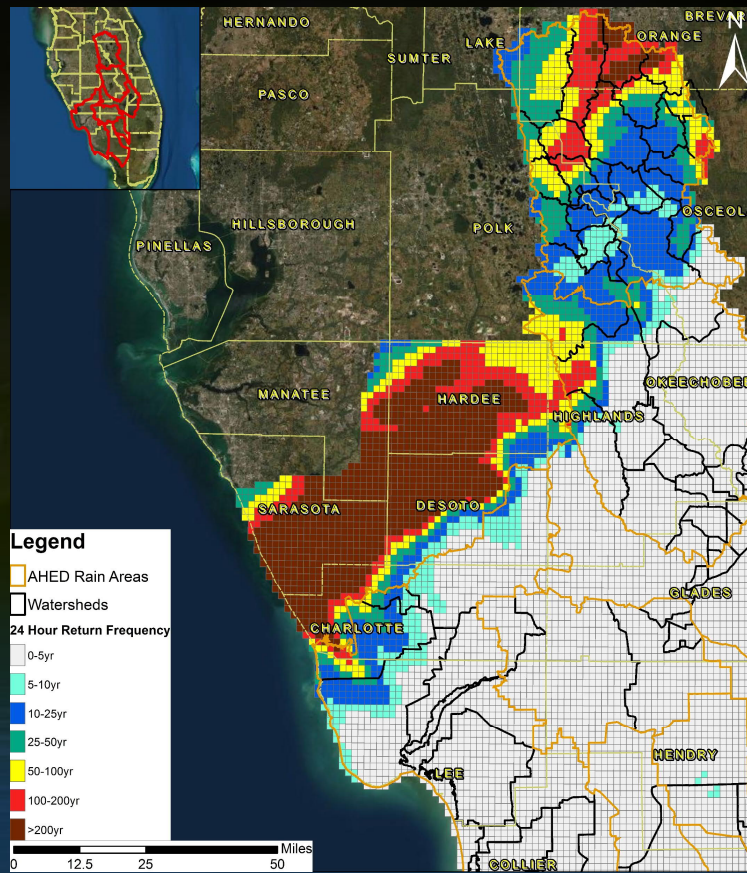
BCB COC01 Coastal Structure Outfall Analysis



- Peak Stage: 10.3 ft-NGVD (New Record High)
- Peak Exceeded Design Water Levels of Structure
- Surge ~400 CFS flow inland (negative flow)
- Recovery to normal levels ~12 hours (9/29/22 Morning)
- Structure locked fully open – storm surge forecast & high potential for communication loss
- Loss of power & generator delayed return of normal structure control until October 3rd

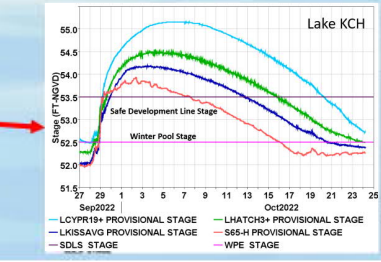
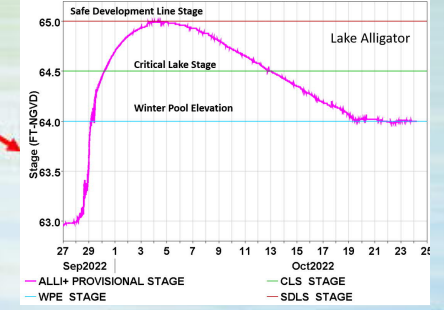
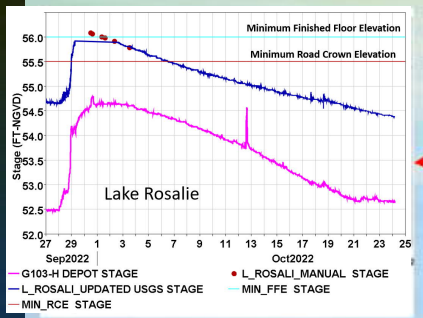
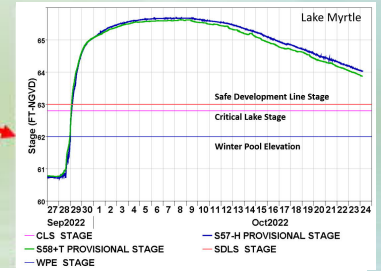
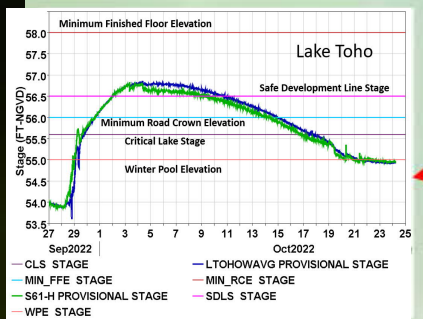
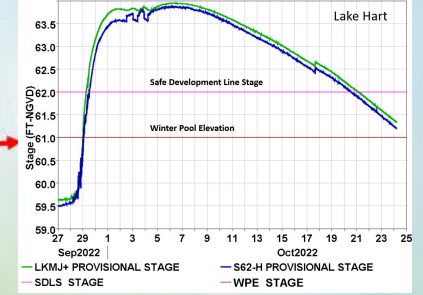
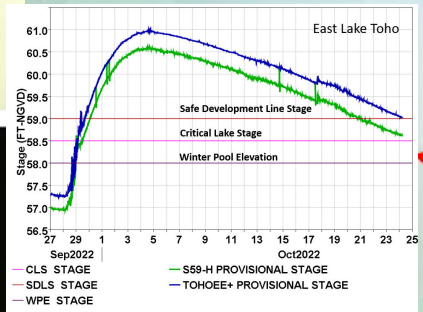
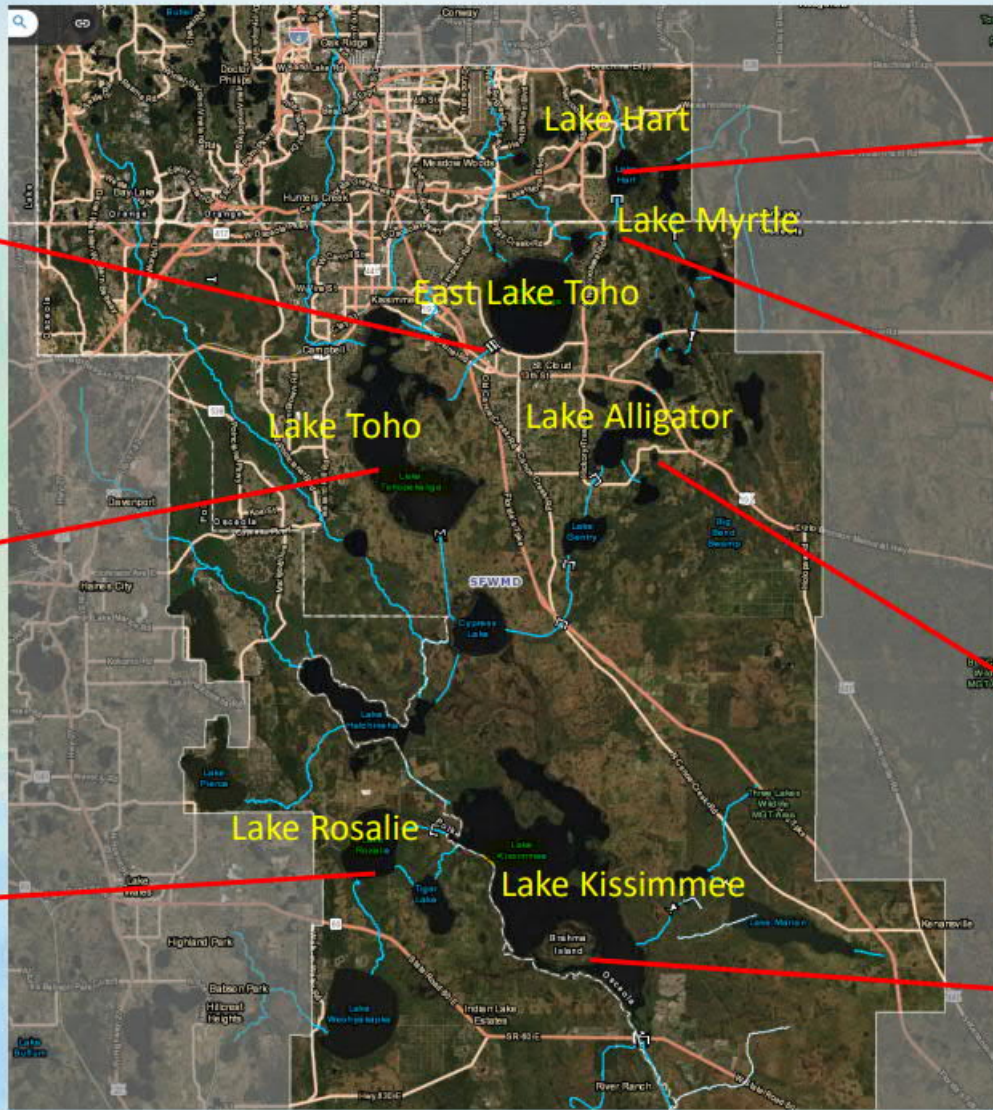
Rainfall

Maxima 14.83"
East Lake Toho



Return frequency estimated by comparing NOAA Atlas 14 Rainfall Frequency values to maximum rainfall totals for 24 hours and 72 hours, per NEXRAD pixel

SOUTH FLORIDA WATER MANAGEMENT DISTRICT



Slide Courtesy: John Mitnik

Resiliency among District Priority Actions

EXPANDING MONITORING AND DATA ANALYSIS

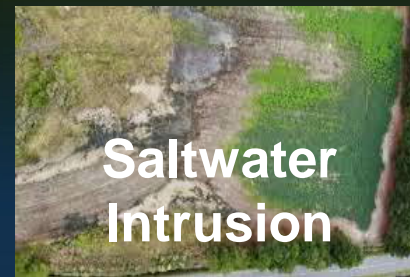
ADVANCING FUTURE CONDITIONS ASSESSMENTS

HARDENING FLOOD PROTECTION INFRASTRUCTURE

INVESTING IN ALTERNATIVE WATER SUPPLY SOURCES

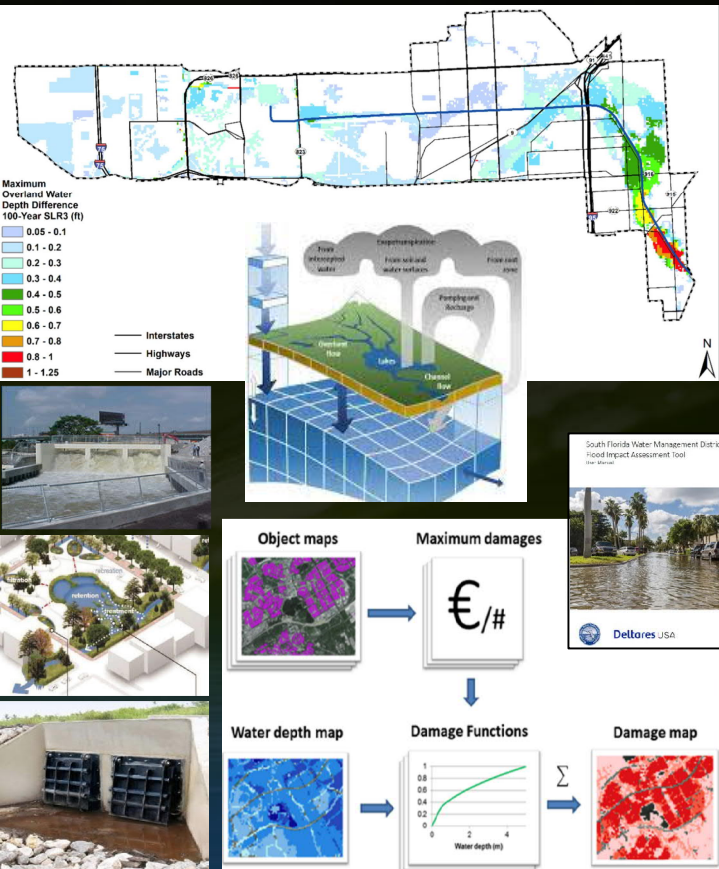
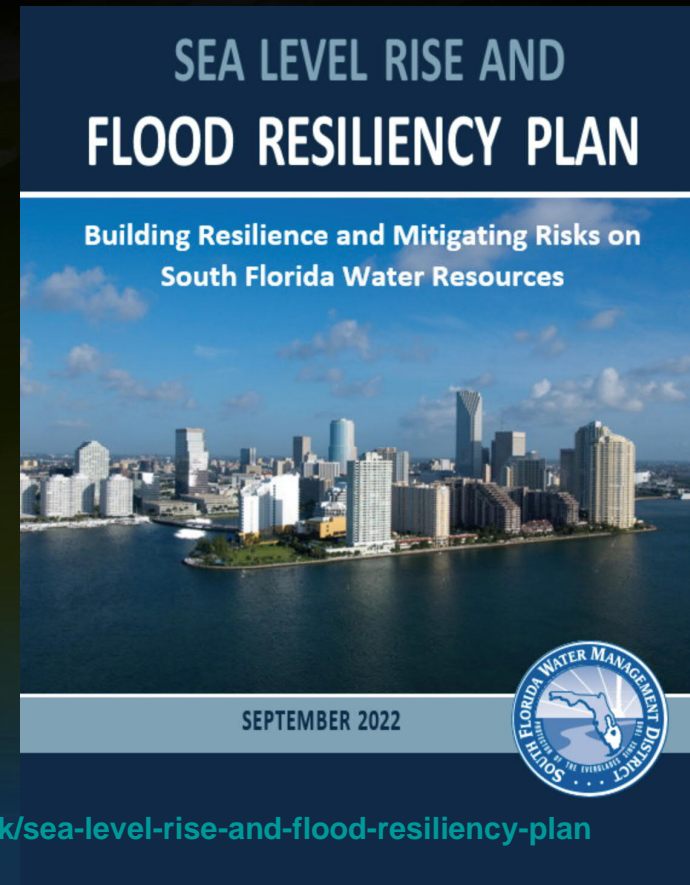
CONTINUING TO RESTORE NATURAL SYSTEMS

PROMOTING STAKEHOLDER ENGAGEMENT AND OUTREACH



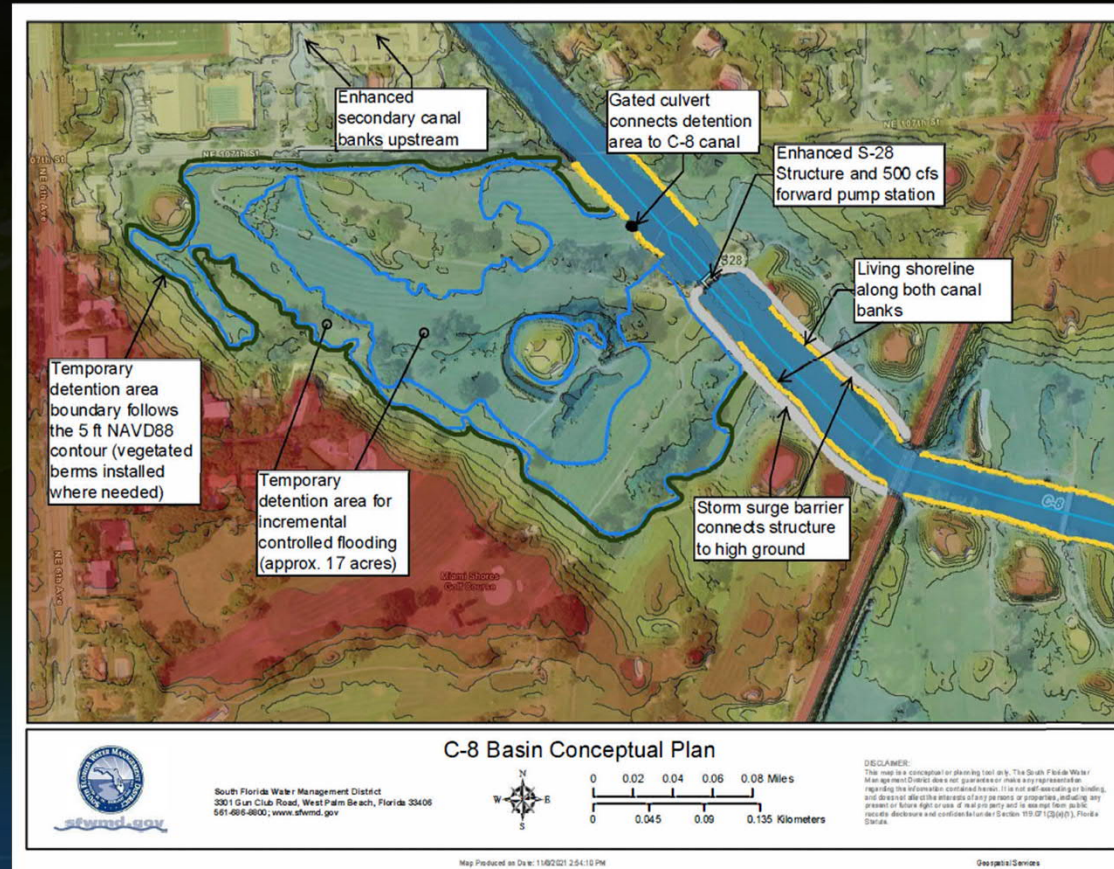
District Resiliency Planning

Reducing the risks of flooding, sea level rise and other climate impacts on water resources and increasing community and ecosystem resiliency in South Florida



Moving into Implementation: C-8 Basin Resiliency

- Recent Award Recommendation from FDEM/FEMA BRIC
- Currently Advancing Design
- Basinwide strategy to reduce flood risks due to sea-level rise and extreme rainfall; protect water resources and water supply sources
- Combination of Green and Gray Infrastruct.
- Increasing water management flexibility
- Restore S-28 Structure discharge capacity
- Increase the basin's flood protection level of service, including Miami Dade's secondary canal enhancements
- Enhance quality of life in the region



Coastal Structures Hardening and Self Preservation Mode

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

Other automation and floodproofing needs

Control Panel Upgrades / Hardening



- Urgent need to optimize and harden operation of structures during storm surge and higher tide events, addressing Hurricane Irma/Matthew/Dorian/Ian gate-open lockouts
- Water Supply exposure to saltwater intrusion: wellfield protection zones vulnerability – Regional Significant Assets (RSA)
- Exacerbated upstream flood risks
- Focus on enhancing electronic/mechanical components and floodproofing of RSAs

Resiliency and Ecosystem Restoration

Ecosystem Restoration is central in supporting SFWMD's efforts to address the effects of climate change and sea level rise.

Completed restoration projects increase the region's ability to better manage water and extreme weather events

The restoration of beneficial freshwater flows throughout the system slows down saltwater intrusion and promote sustainable aquifer recharge rates, healthier estuaries and bays, reduced marsh dry outs and more stable coastlines with major Nature-Based Features.



Governor DeSantis' Executive Order 23-06: Achieving Even More Now for Florida's Environment



Exec. Order further advances the protection of Florida's environment and water quality.

Ramps up efforts to accomplish even more by securing \$3.5 billion over four years for:

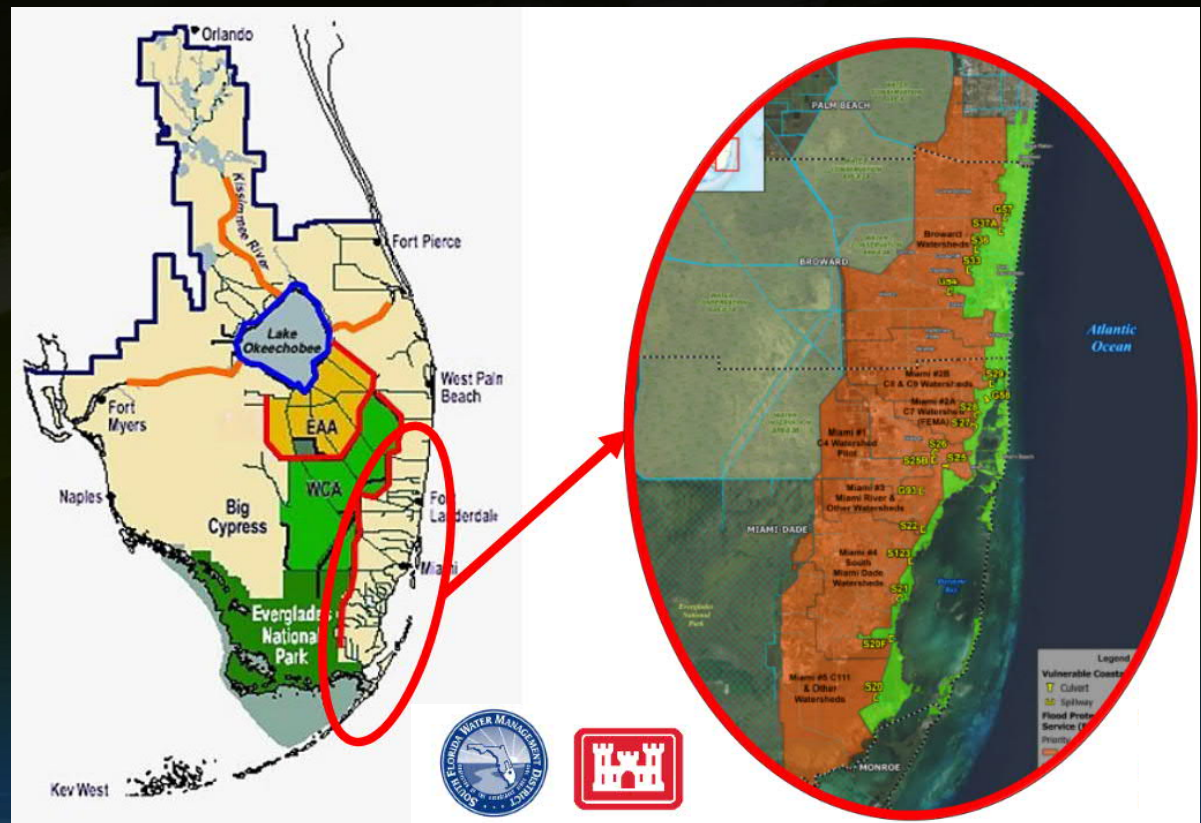
- Everglades restoration and the protection of water resources
- Continuing to expedite the Comprehensive Everglades Restoration Plan projects
-
- Strengthening resiliency efforts, through the Resilient Florida Program (Section 3)

C&SF Flood Resiliency Study

Under the Authority of Section 216 of the Flood Control Act of 1970

- Reduce flood risk and increase flood resiliency in high-risk urban watersheds in southeast Florida, while looking to enhance the overall benefits of the multipurpose C&SF Project
- New opportunity to improve the C&SF Project and enhance quality of life
- Ongoing study phase: Round 1 Development of Alternatives
- Inviting all engineers, planners, environmental experts, and the public to join us in this challenge and to provide contributions to this ongoing study

www.sfwmd.gov/C&SF

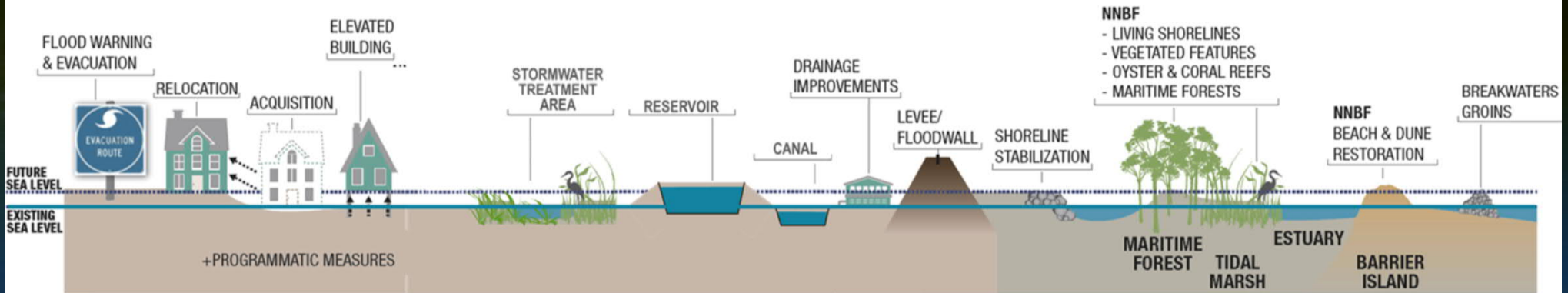


Our future?



POTENTIAL MEASURES TO IMPROVE RESILIENCE AND SUSTAINABILITY

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



Stakeholder and Public Engagement: Resiliency Coordination Forum

- Fact-finding forum to engage partners on water and climate resilience topics
- Promote collaboration among the South Florida Water Management District, local, state, federal and tribal partners on water management initiatives related to resiliency
- Hold proactive discussions, leveraging technical knowledge and exchanging information
- Discuss tangible asset-level solutions and support decision making on water resource management.



Upcoming Meeting on March 1st, 2023

<https://www.sfwmd.gov/our-work/resiliency-coordination-forum>

Resiliency Issues on the Horizon

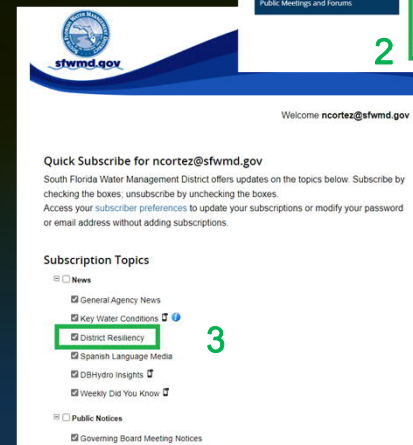
- There is a problem and there are opportunities
- It will take time, money and dedication to solve
- Collaboration is key: solutions span multiple boundaries
- SFWMD is strongly committed to resilience



Photo by Paul Krashefski

How can you be involved?

- 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 / News
- Contribute on our initiatives and send us an email to resiliency@sfwmd.gov
- Visit www.sfwmd.gov/resiliency to get updated information
- Visit www.sfwmd.gov/meetings to attend and participate at District events





Thanks!

Carolina Maran, Ph.D., P.E.,
cmaran@sfwmd.gov
District Resiliency Officer

South Florida Water Management District
www.sfwmd.gov/resiliency