SOUTH FLORIDA WATER MANAGEMENT DISTRICT

2022 Lower West Coast Water Supply Plan Update



2022 LWC Stakeholder Meeting 2 May 25, 2022





- Welcome and Opening Remarks Tom Colios, SFWMD
- SFWMD Water Resource Protection Measures Natalie Kraft, SFWMD
- > Update on Everglades Restoration Projects Leslye Waugh, SFWMD
- Regional LWC Groundwater Modeling and Saltwater Interface Mapping Pete Kwiatkowski, SFWMD
- **SFWMD Resiliency Initiatives** Carolina Maran, SFWMD
- Next Steps Bob Verrastro, SFWMD
- > Adjourn

Questions and public comment will occur after each presentation.

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Welcome and Opening Remarks





Tom Colios Section Leader, Water Supply Planning

2022 LWC Stakeholder Meeting 2 May 25, 2022



Lower West Coast Planning Area

Includes:

• Lee County and portions of Collier, Glades, Hendry, Monroe, and Charlotte counties

> Population:

- 2020 1,188,599
- 2045 1,617,071*
- Major agricultural industry
 - ~300,000 acres of irrigated crops
- Significant environmental features

*University of Florida (UF) Bureau of Economic and Business Research estimate.

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Regional Water Supply Plan

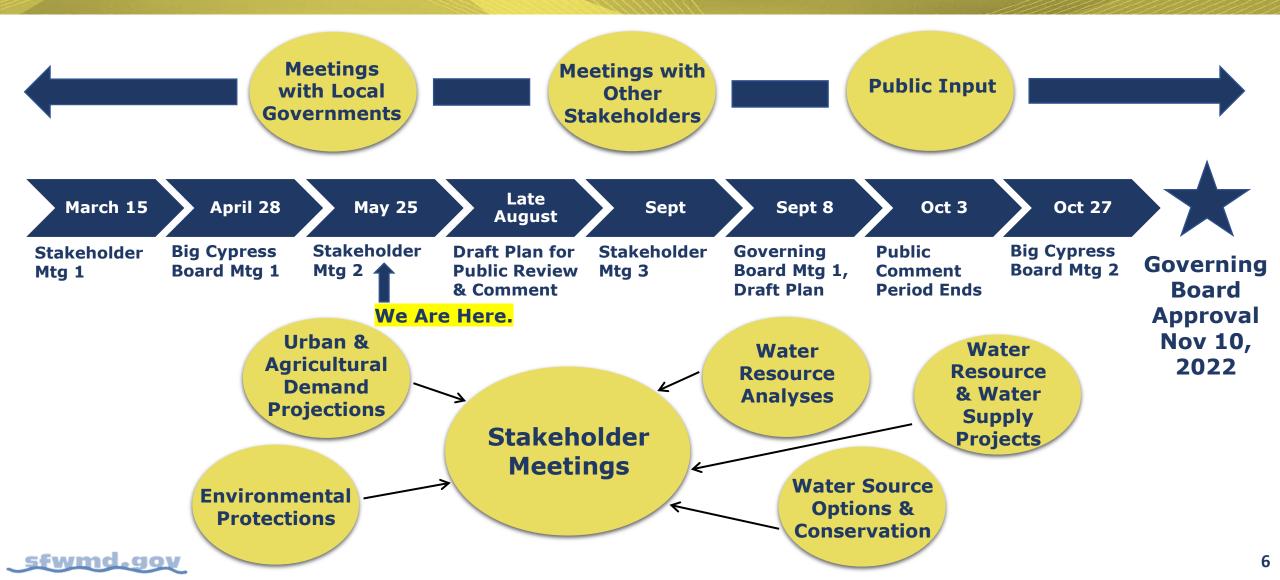
What It Does

- Provides a road map to meet future water needs while protecting water resources and natural systems
- Conducts a planning-level approach
- Projects future water demands
- Identifies and evaluates water source options

What It Does NOT Do

- Does not authorize consumptive use permits
- Does not establish MFLs
- Does not adopt rules
- Does not require water users to implement specific projects
- Does not address surface water quality issues (e.g., algal blooms)

Water Supply Plan Update Timeline

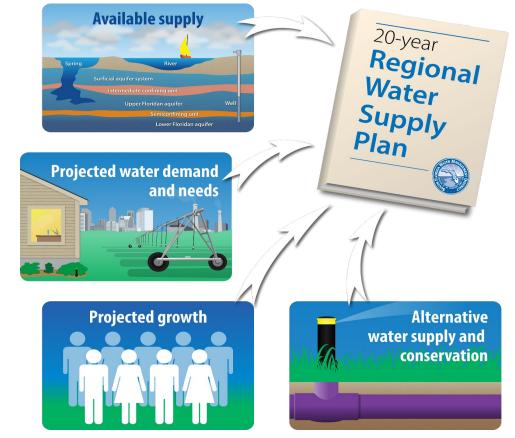


Major Efforts Since the First Meeting

Prepared Draft Chapters

- $1-Introduction^*$
- 2 Demand Estimates and Projections
- 3 Demand Management: Water Conservation*
- 4 Water Resource Protection*
- 5 Water Source Options
- 6 Water Resource Analysis
- 7 Water Resource Development Projects
- Big Cypress Basin Board Presentation April 28
- Ongoing coordination with utilities

* Signifies that these chapters are now available for public review





Caloosahatchee Estuary in Fort Myers

Protecting Water Resources in the South Florida Water Management District

Natalie Kraft *Lead Scientist*

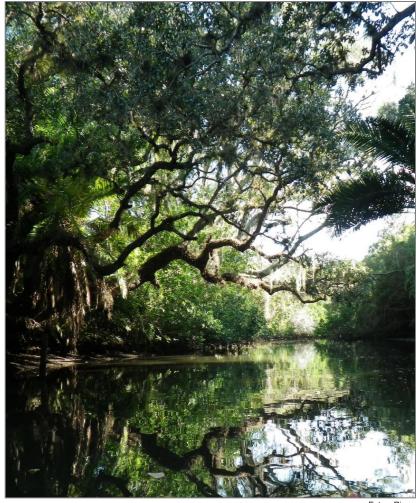
Lower West Coast Water Supply Plan Public Workshop May 25, 2022



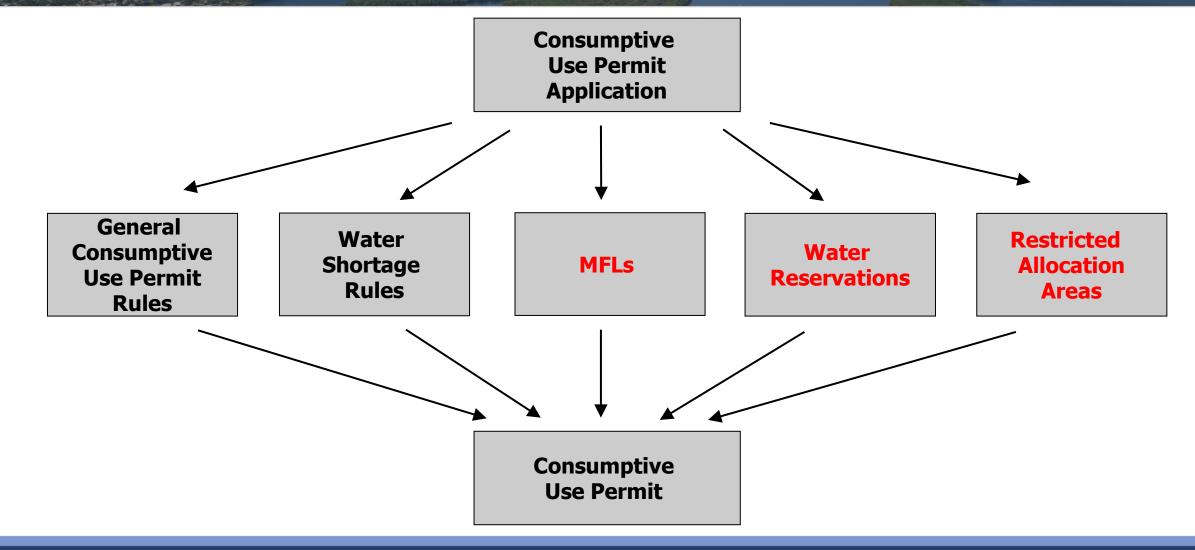
Water Resource Protection Tools

- Minimum flows and minimum water levels (MFLs)
- Water reservations
- Restricted allocation areas (RAAs)

- All three tools are adopted by rule in the Florida Administrative Code (F.A.C.)
- More than one tool can protect a waterbody



Factors Considered in Consumptive Use Permitting





Minimum Flows and Minimum Water Levels (MFLs)

Statutory Authority: Chapter 373, F.S.

Defined in 40E-8.021, F.A.C.

- MFLs: Point at which further withdrawals will cause "significant harm" to the water resources or ecology of an area
- Significant harm: Temporary loss of water resource functions that takes more than 2 years to recover but is less severe than serious harm
- May be adopted for surface waters or aquifers



Great blue heron, *Ardea herodias*, in Big Cypress National Preserve From: https://www.flickr.com/photos/andrei_deev/444685936

Water Resource Protection Conceptual Model

	Water Resource Protection Tools	Water Resource Protection Standards	Observed Impacts
Water Levels/Flow Decreasing	Permittable Water Reservation of Water	NO HARM (1-in-10 Level of Certainty*)	Normal Permitted Operations Environmental Restoration
	Phase I Water Shortage Phase II Water Shortage	HARM	Temporary loss of water resource functions taking 1 to 2 years to recover
	— MINIMUM FLOWS & MINIMUM WATER LEVELS —		
Drought Severity Increasing	Phase III Water Shortage	SIGNIFICANT HARM	Water resource functions require multiple years to recover (> 2 year)
	Phase IV Water Shortage	SERIOUS HARM	Permanent or irreversible loss of water resource functions

* 1-in-10 Level of Certainty – Reasonable assurance that the proposed use will not harm water resources or interfere with existing legal water users up to a 1-in-10-year drought condition (a drought condition that occurs only once in 10 years).

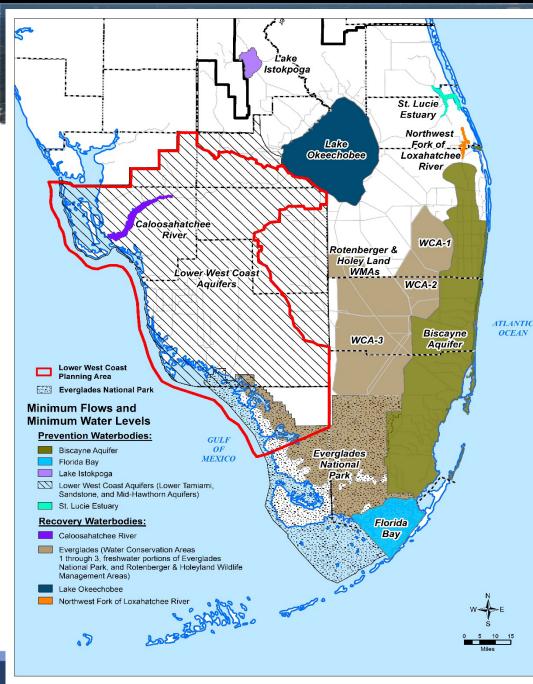
MFL Recovery and Prevention Strategies

Subsection 373.0421(2), F.S.

Recovery Strategy for those <u>not</u> meeting the MFL at the time of adoption

- Achieve recovery to the established MFL as soon as practicable
- Prevention Strategy for those that <u>are</u> meeting the MFL but not expected to meet it in 20 years
 - Prevent the existing flow or level from falling below the established MFL
- Strategies are included in the planning process
- Adopted simultaneously with MFL rule adoption in the SFWMD

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MFLs in the SFWMD

With **Prevention** Strategies

- Biscayne Aquifer 2001
- Lower West Coast Aquifers 2001
- St. Lucie Estuary 2002
- Lake Istokpoga 2006
- Florida Bay 2006

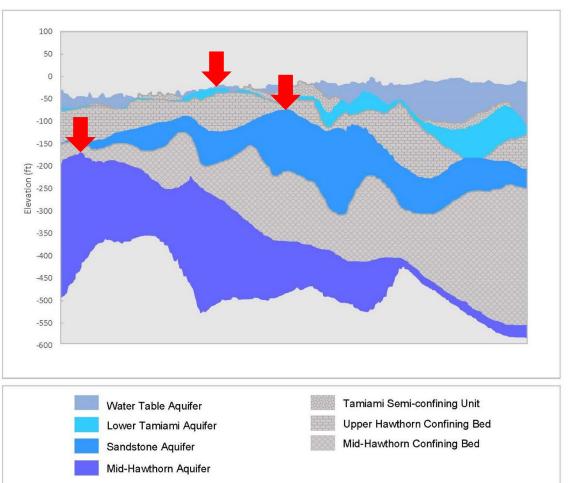
With <u>Recovery</u> Strategies

- Caloosahatchee River 2001
- Everglades 2001
- Lake Okeechobee 2001
- Northwest Fork of Loxahatchee River 2003

Cover ~6.6 million acres Districtwide

Lower West Coast Aquifers Adopted MFL

Generalized Hydrogeologic Cross-Section



sfwmd.gov

Adopted in 2001 **Section 40E-8.331, F.A.C.**

The minimum levels for the

- Lower Tamiami aquifer
- Sandstone aquifer
- Mid-Hawthorn aquifer

shall equal the structural top of the aquifer

An MFL violation occurs when:

 Water level drops below the top of the uppermost geologic stratum that comprises the aquifer, at any point in time

Lower West Coast Aquifers Prevention Strategy

Subsection 40E-8.421(4), F.A.C. and LWC Water Supply Plan

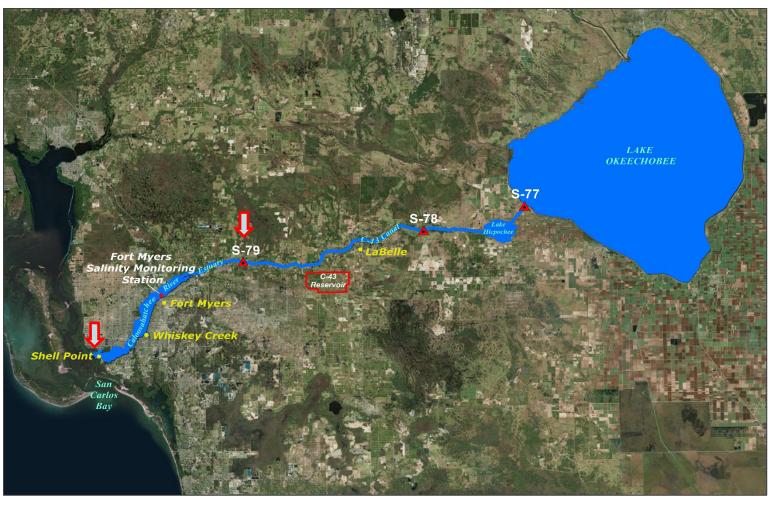
- Establish "no harm" maximum permittable regulatory levels for each aquifer
 - Maximum developable limits in Section 3.9.3 of the Applicant's Handbook or Water Use Permit Applications in the South Florida Water Management District
- Implement rule criteria to prevent harm through consumptive use permitting process
 - Consumptive use permitting criteria in Rule 40E-2.301, F.A.C.
- Construct and operate water resource and supply development projects
 - Alternative water supply and water conservation projects
- Implement Chapter 40E-21, F.A.C., water shortage plan as needed to prevent serious harm during drought conditions in excess of 1-in-10-year level of certainty

Caloosahatchee River Adopted MFL

Adopted in 2001, reevaluated in 2019

Subsection 40E-8.021(2), F.A.C.

<u>Caloosahatchee River</u> – Surface waters that flow through the S-79 structure, combined with tributary contributions below S-79 that collectively flow southwest to San Carlos Bay.



Caloosahatchee River MFL Reevaluation

- Evaluated new data and information obtained since 2003 (previous reevaluation)
- Developed and applied models and a resource-based approach to:
 - Evaluate alterations in the watershed and the effects on flows
 - Understand water sources and their contributions to the estuary
 - Assess responses of multiple ecological indicators to flow scenarios
 - Evaluate performance of the MFL recovery strategy
 - Reevaluate MFL criteria
- Conducted technical analysis and revised MFL criteria
- Drafted a technical report
- Conducted an independent scientific peer review on technical approach, analysis, and report
- Gained public input

Caloosahatchee River MFL Reevaluation

Governing Board authorizes rulemaking to revise MFL December 2017 Governing Board adopts minimum flow of 400 cfs at S-79 September 2018 October 2018 Administrative hearing held following a rule challenge March 2019 Administrative law judge issued final order; rule was a valid exercise of delegated legislative authority April 2019 Governing Board directs staff to evaluate potential to increase minimum flow above 400 cfs May/June/Sept. 2019 Public workshops held October 2019 Governing Board adopts revised minimum flow of 457 cfs December 2019 Final MFL rule effective

Caloosahatchee River Adopted MFL

Subsection 40E-8.221(2), F.A.C.

- 30-day moving average flow of 457 cfs at the S-79 water control structure
- An MFL <u>exceedance</u> occurs during a 365-day period when the 30-day moving average flow at S-79 is below 457 cfs
- An MFL violation occurs when an exceedance occurs more than once in a 5-year period



Caloosahatchee River Recovery Strategy

Subsection 40E-8.421(2), F.A.C.

Components listed in LWC Water Supply Plan:

- Research and monitoring plan
- Caloosahatchee River (C-43) West Basin Storage Reservoir
- Water reservation rule [Subsection 40E-10.041(3), F.A.C.] to ensure intended benefits of reservoir
- Water control plan for the reservoir



Water Reservations

Statutory Authority: Chapter 373, F.S.

- Reserves water for the protection of <u>fish and</u> wildlife or public health and safety
- Prevents use of <u>reserved water</u> for consumptive uses
- Protects existing legal uses unless they are contrary to the public interest
- Required for Comprehensive Everglades Restoration Plan (CERP) projects per federal Water Resources Development Act of 2000
- May be used as part of MFL recovery or prevention strategy



Osprey, *Pandion haliaetus*, and bass, *Micropterus* sp. on Merritt's Mill Pond From: http://nykography.weebly.com

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Water Reservations Do Not...

- Prevent use of unreserved water or water allocated under consumptive use permits
- Establish an operating regime
- Drought-proof the natural system
- Ensure wildlife proliferation



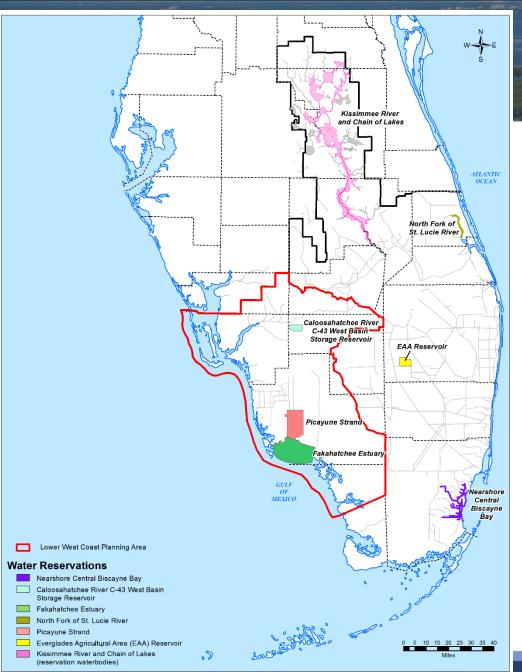


American aliigator *Alligator mississipiensis* From http://www.photodrom.com

Drought conditions From: http://sfwmd.gov



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Water Reservations in the SFWMD

- Picayune Strand 2009
- Fakahatchee Estuary 2009
- North Fork of the St. Lucie River 2010
- Nearshore Central Biscayne Bay 2013
- Caloosahatchee River (C-43) West Basin Storage Reservoir – 2014
- EAA Reservoir 2021
- Kissimmee River & Chain of Lakes 2021

Cover 356,281 acres Districtwide

Caloosahatchee River (C-43) West Basin Storage Reservoir Adopted Water Reservation

Subsection 40E-10.041(3), F.A.C.

All surface water contained within and released, via operation, from the reservoir

- Prospective reservation adopted by rule in 2014 for protection of fish and wildlife
- Reservoir & reservation are key components of the Caloosahatchee River MFL recovery strategy
- CERP project being constructed through SFWMD/USACE cost-share agreement



Double crested cormorants, *Phalacrocorax auritus*, with roseate spoonbill, *Platalea ajaja*, coming in for a landing From: https://tockify.com/apogeephoto/detail/99/1490328000000

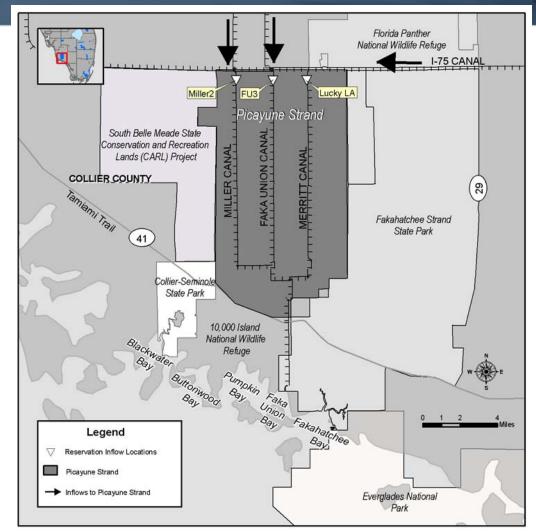
Picayune Strand Adopted Water Reservation

Subsection 40E-10.041(1), F.A.C.

- Reservation adopted by rule in 2009 for protection of fish and wildlife
- Required for the CERP Picayune Strand Restoration Project (PSRP) to restore pre-drainage condition
- Water reserved:

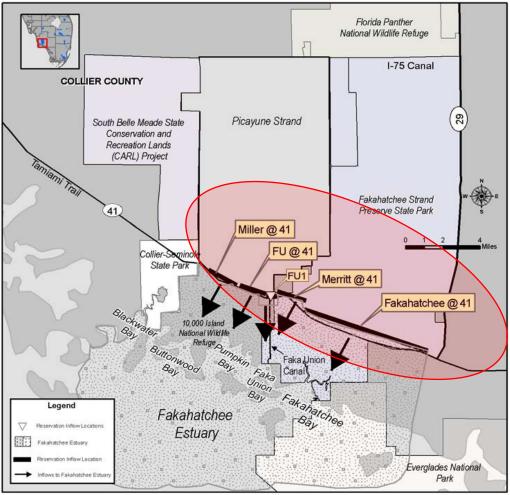
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- Existing surface water in the strand
- Water made available through the PSRP (simulated at three weirs)
- All groundwater in the water table and unconfined portions of the Lower Tamiami aquifer beneath the strand



Historic inflow locations into Picayune Strand from Miller, Faka Union and Merritt Canals

Fakahatchee Estuary Adopted Water Reservation



Subsection 40E-10.041(2), F.A.C.

- Reservation adopted by rule in 2009 for protection of fish and wildlife
- Supports the CERP Picayune Strand Restoration Project (PSRP) objective to improve flows to coastal estuaries

Water reserved:

- All surface water flowing into the estuary via one weir and four transects
- All groundwater in the water table and unconfined portions of the Lower Tamiami aquifer beneath the estuary

Historic inflow locations into Fakahatchee Estuary from Picayune Strand

Restricted Allocation Areas (RAAs)

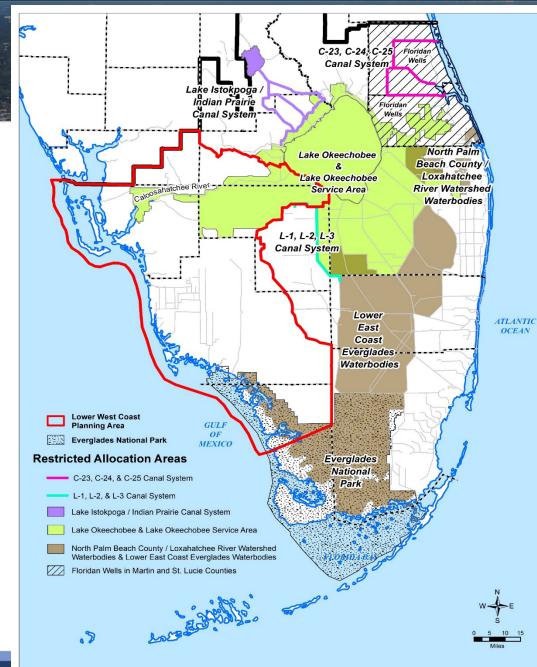
Areas from which new or increased water allocations are restricted

- Implemented for a variety of reasons:
 - Where there is a lack of water available to meet the projected needs of the region
 - To protect water for natural systems and future restoration projects (CERP)
 - As part of MFL recovery or prevention strategies
- Listed in Section 3.2.1 of the Applicant's Handbook, incorporated by reference in Rule 40E-2.091, F.A.C.



Wild American flamingos, Phoenicopterus ruber, in Stormwater Treatment Area 2 From: <u>http://whqeps02p:8085/wildlife/#/asset/1353</u> (SFWMD website)





Restricted Allocations Areas in the SFWMD

- C-23, C-24, & C-25 Canal System 1981
- L-1, L-2, & L-3 Canal System 1981
- Lake Istokpoga/Indian Prairie Canal System – 1981
- North Palm Beach County/Loxahatchee River Watershed – 2007 (amended 2022)
- Lower East Coast Everglades Waterbodies – 2007
- Pumps on Floridan Wells in Martin and St. Lucie Counties – 2007
- Lake Okeechobee & Lake Okeechobee Service Area – 2008
- Utilization of the Upper Floridan Aquifer or Avon Park Permeable Zone Near the C-18W Reservoir – 2022

Cover ~4.4 million acres Districtwide

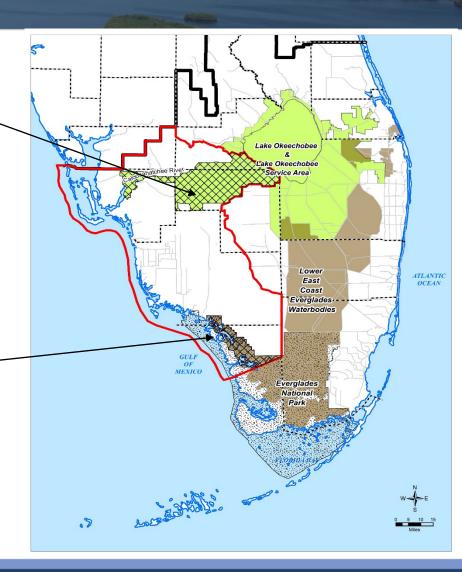
Restricted Allocation Areas in the LWC Planning Area

Lake Okeechobee & Lake Okeechobee Service Area

Water allocations are limited to base condition water uses that occurred from April 1, 2001 to January 1, 2008

Lower East Coast Everglades Waterbodies

Water allocations are limited to base condition water uses permitted as of April 1, 2006





Thank You

nkraft@sfwmd.gov (561) 682-2196



Questions and Public Comment



Picayune Strand

If you are participating via <u>Zoom</u>:

- Use the Raise Hand feature
- If you are participating via <u>phone</u>:
 - *9 raises hand
 - *6 mutes/unmutes your line
- When you are called on, please state your full name and affiliation prior to providing comments and/or questions.



Caloosahatchee Estuary in Fort Myers

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Comprehensive Everglades Restoration Plan: Project Updates

2022 Lower West Coast Water Supply Plan Update – Public Stakeholder Meeting #2



May 25, 2022

Leslye Waugh Section Administrator Ecosystem Restoration Planning & Project Management



Restoration Projects

- State Restoration Projects
- Comprehensive Everglades Restoration Plan (CERP) Projects
- CERP Planning Projects
- Integrated Delivery Schedule (IDS)



Restoration Projects

State Projects

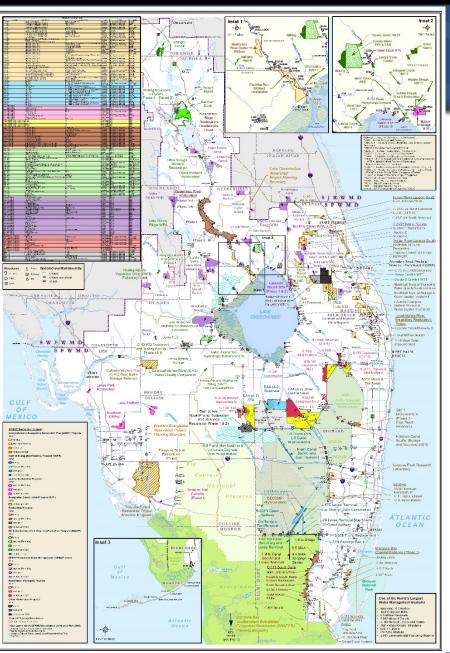
- Restoration Strategies Program
- Everglades Construction Project
 - Stormwater Treatment Areas (STA)
- Northern Everglades and Estuaries Program
 - Dispersed Water Management

Federal Projects

- South Florida Ecosystem Restoration Program
 - Comprehensive Everglades Restoration Plan (CERP)
 - Non-CERP

sfwmd.gov

https://sfwmd.maps.arcgis.com/apps/MinimalGallery/index.html?appid=1facf 32f199240b49a326432258c102f



Presenter – Leslye Waugh



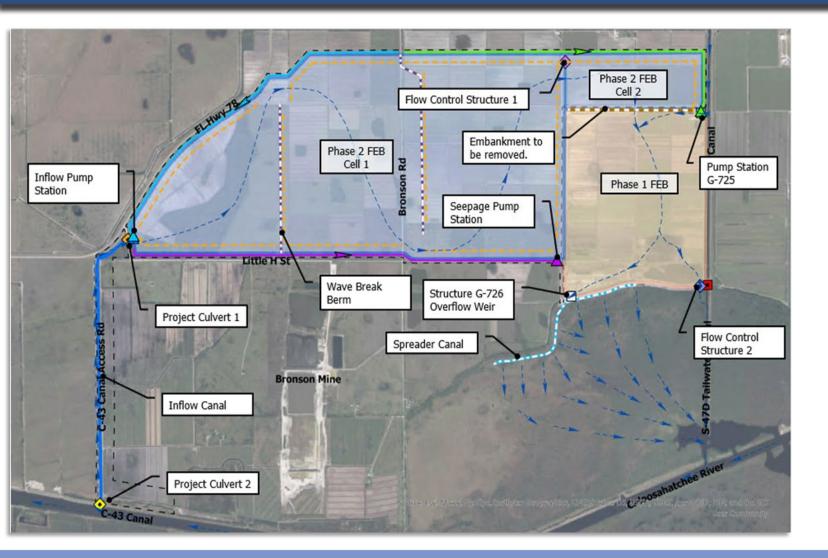


State Restoration Projects





Lake Hicpochee Storage and Hydrologic Enhancement Project



Phase 1

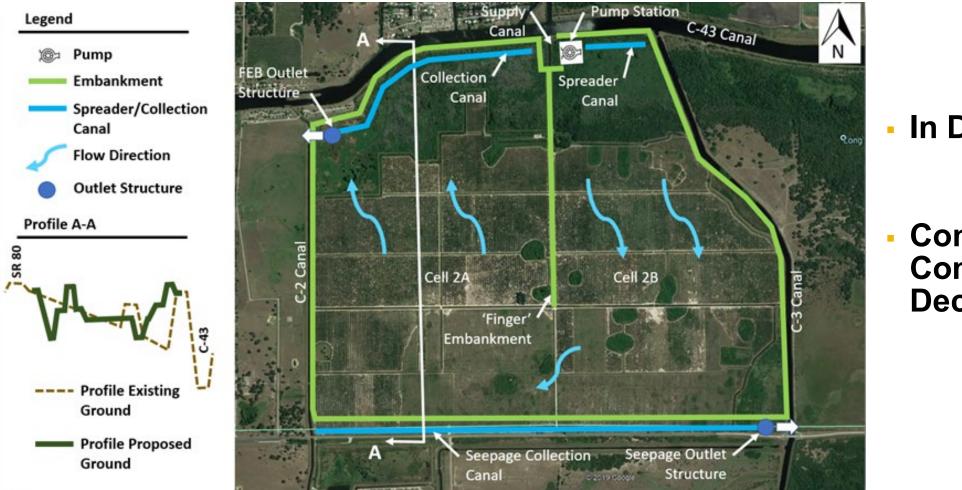
Operational

Phase 2:

In Design •



Boma Flow Equalization Basin (FEB)



In Design

Construction Completion December 2025



Caloosahatchee (C-43) Reservoir Water Quality Component

Operational when reservoir is completed

Working Group









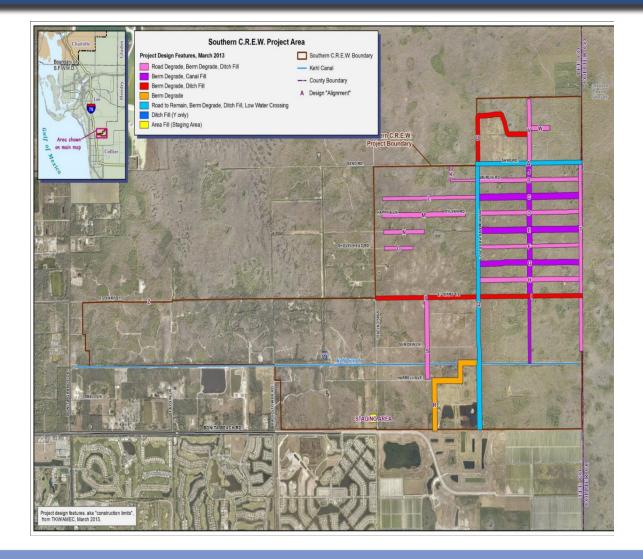


Southern CREW

- 4,000 acres of restored wetlands to improve regional hydrology
- Completed in 2018



Red-shouldered hawk on the CREW Boardwalk









Comprehensive Everglades Restoration Plan (CERP) Project Updates



Central Everglades Planning Project (CEPP)







CEPP Everglades Agricultural Area (EAA) Phase

- STA under construction by SFWMD
- Canal Conveyance Improvements in design by SFWMD
- Reservoir in design by USACE

CEPP North Phase

SFWMD in design by SFWMD

CEPP South Phase

- S-333N spillway completed by SFWMD
- Old Tamiami Trail Removal completed by SFWMD
- L-67A Culverts and L-67C Levee Gaps under construction by USACE
- USACE lead on design and construction of remaining features
- CEPP New Water Phase
 - Seepage Barrier in design by SFWMD



Lake Okeechobee Watershed Restoration Project (LOWRP)



sfwmd.gov

Project Objectives

- Increase water storage and improve Lake Okeechobee water levels
- Improve quantity and timing of discharges to the Estuaries
- Restore wetlands
- Improve water supply

Aquifer storage and recovery

- 55 ASR wells
- 308,000 ac-ft of storage per year

Wetland restoration

- Paradise Run ~4,700 acres
- Kissimmee River Center ~1,200 acres
- Anticipate Water Resources Development Act (WRDA) of 2022 authorization

Caloosahatchee River (C-43) West Basin Storage Reservoir

SFWMD began construction in 2015

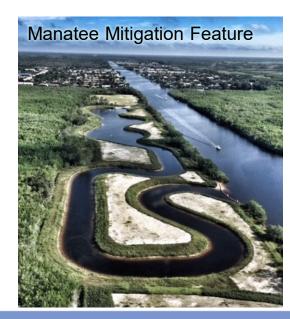
- Purpose is to improve salinity balance in the Caloosahatchee Estuary by capturing and storing basin runoff and Lake Okeechobee regulatory releases during the wet season and providing essential flows during the dry season.
- 10,700-acre area with 170,000-acre-feet storage capacity
- Construction completion expected in 2024

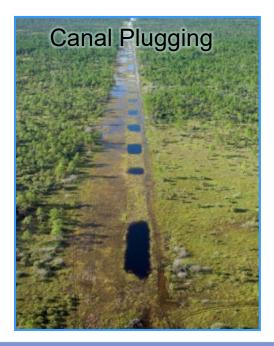


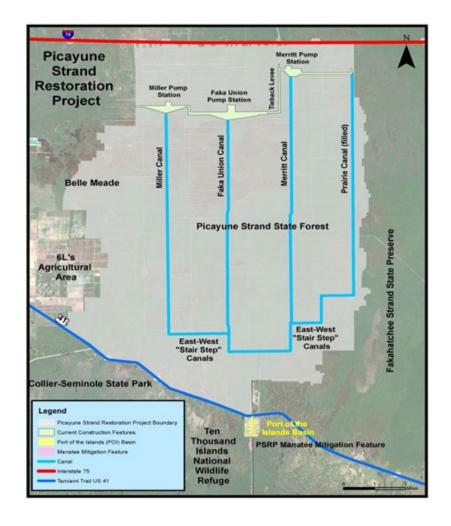


Picayune Strand Restoration Project (PRSP)

- PSRP began in 2007 with the plugging of the northern 7 miles of the Prairie Canal and the removal of 65 miles of roadways
- 3 pump stations are complete
- Road removal and canal plugging ongoing
- Manatee mitigation feature is complete
- Southwest Protection Feature under construction
- Project completion expected 2025







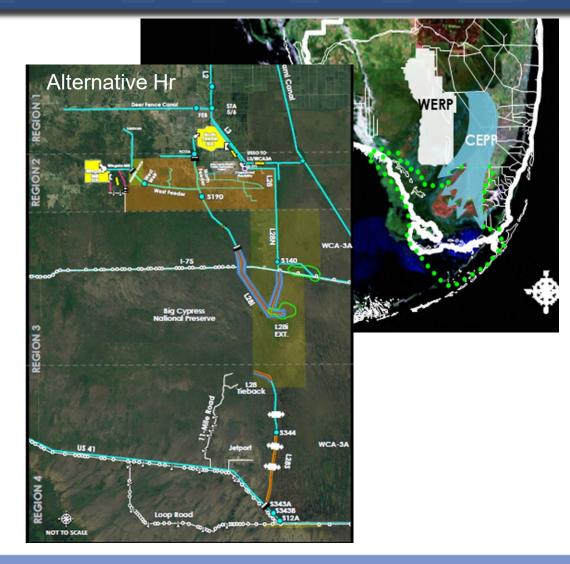
Western Everglades Restoration Project (WERP)

Objectives

- Improve the quantity, quality, timing and distribution of water in the Western Everglades.
- Reestablish ecological connectivity of wetland and upland habitats in the western Everglades with restored freshwater flow paths
- Reduce the severity and frequency of wildfires
- Restore low nutrient conditions

Proposed Tentatively Selected Plan (TSP): Alternative Hr

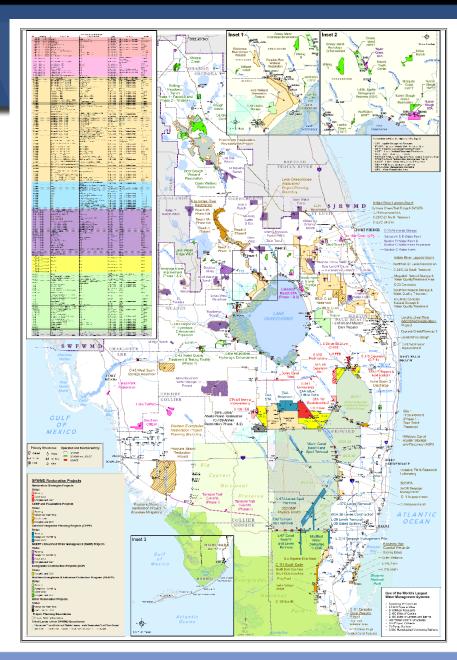
- Currently in planning phase
- Proposes management measures such as 2 STAs (roughly 7,000 acres total), canal backfilling, and culverts to restore hydrology
- Utilizes existing water from the North Feeder Basin and Western Basin
- Does not use discharges from Lake Okeechobee
- Anticipate WRDA 2024 authorization





Planning Projects

- Lake Okeechobee Watershed Restoration Project (LOWRP) (includes ASR Wells)
- Western Everglades Restoration Project (WERP)
- Biscayne Bay Southeastern Everglades Ecosystem Restoration Project (BBSEER)



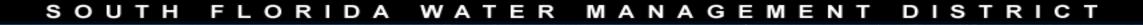
Integrated Delivery Schedule (IDS)

- Proven to be a steady, reliable "road map" that guides projects and maximizes the benefits of all Comprehensive Everglades Restoration Plan (CERP) efforts
- Schedule is reviewed each year and has yielded significant Everglades restoration progress
- Developed through an extensive public process with participation of the South Florida Ecosystem Restoration Task Force and its Working Group

https://www.saj.usace.army.mil/IDS

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P2		C-111 South Dade - 5-332 B Fump Station Replacement C-111 South Dade - 5-332 C Fump Station Replacement CERF GENERATION 1 (AUTHORIZED IN WRDA 2007; PROJECT PA	RTNERSHIP	AGREEME	NT-PPA	EXECUTED	PPA FOR	PHASE 2	OF IRL-S A	NTICIPAT	ED IN 202	•0000•			
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14		Road removal Canal plugging	-	-	=		Ē								
	R B	Indian River Lagoon-South (IRL-S) G-44 Rospecie C-44 SIA & Fump Station	=		encone protect	200000									
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P9	UU Prose 1 UU Prose 2 UU Prose 2	C-25/24 STA C-25 Reservoir C-25 STA							•1055•	=	=	+00000+			
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P10		CERP GENERATION 2 (AUTHOR Calooschatchee River (C-43) West Basin Storage	IZED IN WRO	DA 2014: P	PAIXEC	UTED EXC	PT WHERE	NOTED)		+10050	00007*				
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P12	III. OFE Plice 1	Biscowne Ray Coastal Wellands (BBCW) Phase 1 Lot East Rowway 27/07 Pump Station (%), ono 27/03 PS Lot South Conversion 27/03 PS			=	-2000	22754		*cotot	000020					
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F14	CERP GEI AAII.H.QQP .G	ERATION 3 (AUTHORIZED IN WRDAS 2016, 2018 AND 2020; CEPP SOUTH F Central Everglades Ronning Project (CEPP) Decomp "Histoch/coethoric performed oncer Moster Design Agreement	PA EXECUT	ED IN 2020	CEAA PP	A EXECUT	ED IN 2021	CEPP N	ORTH AND	NEW WAT	ER PPAS	ANTICIPA	TED IN 20	22)	
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P17		Weitern Everglades Restaration (hoject (MER*) (Anticipate WED-2022: Automation)* Brodyne Sar Southeastern Everglades Lassetern Restaration (SBSLR) (Anticipate WED-2028 Automations*)											program design ar ch will in- yond FY2 and com- perationa ing TBD.		









Leslye Waugh

Section Administrator

Ecosystem Restoration Planning & Project Management

lwaugh@sfwmd.gov

561-682-6483

Questions and Public Comment



If you are participating via <u>Zoom</u>:

- Use the Raise Hand feature
- If you are participating via <u>phone</u>:
 - *9 raises hand
 - *6 mutes/unmutes your line
- When you are called on, please state your full name and affiliation prior to providing comments and/or questions.

C-43 West Storage Reservoir



Groundwater Modeling and Saltwater Intrusion Mapping Update



Peter J. Kwiatkowski, P.G.

Section Administrator, Resource Evaluation

2022 LWC Stakeholder Meeting 2

May 25, 2022



Presentation Outline

Lower West Coast Surficial and Intermediate Aquifer Systems Model (LWCSIM) Simulation Results

➢West Coast Floridan Model (WCFM) Simulation Results

Saltwater Intrusion Mapping Update







Lower West Coast Surficial and Intermediate Aquifer Systems Model (LWCSIM) Overview

Surficial (SAS) and Intermediate aquifer system (IAS)

Used updated hydrostratigraphy for model layering

District publication by Geddes, et al., 2015

MODFLOW-based groundwater flow model

➢ Uniform grid size of 1,000 ft x 1,000 ft

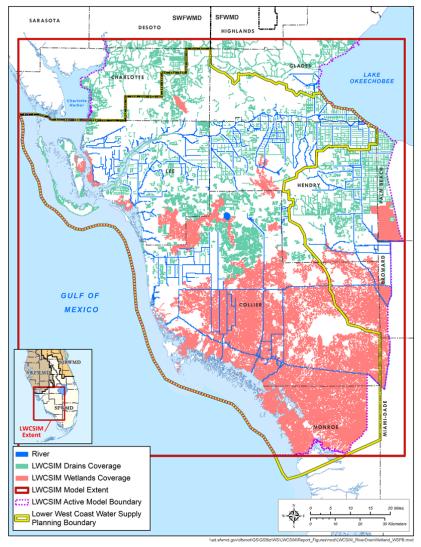
> Monthly stress periods (time-varying data input interval)

➤ Calibration period 1999-2012 and verification period 2013-2014

Calibrated for surface water flows/levels and groundwater levels

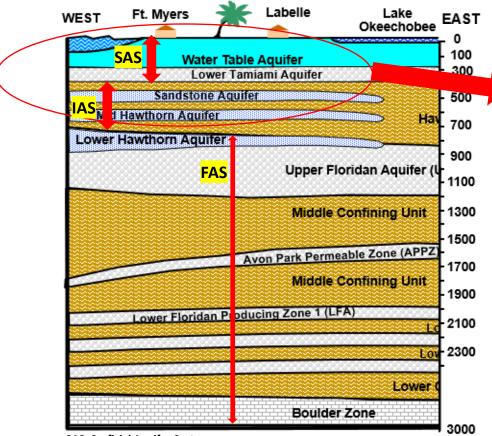
>Independent scientific peer review

- Concurrently with model development
- Consisted of 3 experts in South Florida hydrogeology and groundwater modeling
- > At 3 major milestones the panel reviewed the model and provided feedback



LWCSIM Aquifers and Model Layers

Cross section of generalized hydrogeology of LWC



9-Layer model with 5 productive aquifers

L1	Water Table Aquifer (WTA)	Tamiami Formation
L2	Tamiami Confining Unit (TCU)	Forma
<mark>L3</mark>	Lower Tamiami Aquifer (LTA)	tion
L4	Upper Hawthorn Confining Unit (H1)	
L5	Sandstone Aquifer – Clastic Zone (S2)	Ha
L6	Sandstone Aquifer – Confining Unit (SC)	wth
L7	Sandstone Aquifer – Carbonate Zone (S1)	Hawthorn Group
<mark>L8</mark>	Mid-Hawthorn Confining Unit (H2)	<mark>q10</mark>
<mark>L9</mark>	Mid-Hawthorn Aquifer (MH)	
	Cross-Section Along Column 332 North	

Cross-Section Along Column 332 North

SAS=Surficial Aquifer System IAS=Intermediate Aquifer System FAS=Floridan Aquifer System



Model Application

Reference Condition (2014) and Future Condition (2040)

- Similar simulation period to calibration run-16 years
- Similar climatic conditions to calibration run
- <u>New pumping values</u>

> 2014 Reference Condition

- Public Supply demands from reported pumpage data
- Agricultural and Recreational demands are estimated using AFSIRS*
- Domestic Self Supply (DSS) demands were estimated using per capita usage per county
- Industrial demands from permitted allocations

> 2040 Future Condition

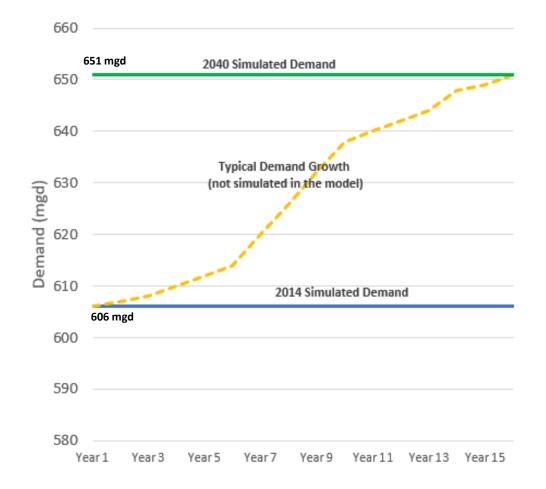
- Public Supply, Agricultural, Recreational, and DSS demands from planning projections
- Industrial demands from permitted allocations

*AFSIRS = Agricultural Field Scale Irrigation Requirement Simulation Model, A.G. Smajstrla



Limitations in Simulating Demands in Scenarios

- For future scenario (2040)
- Model does not simulate annual demand growth
- Simulated demands are "instant on" and continued throughout the period
- Results from the 2040 simulation are considered conservative



Raw water demand shown for all use types

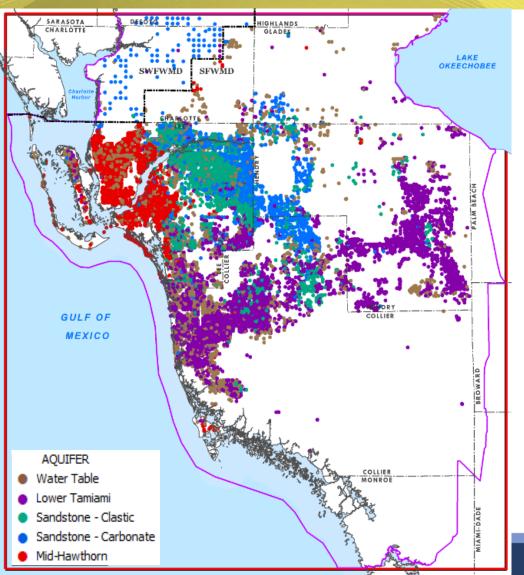
Regional Model Limitations

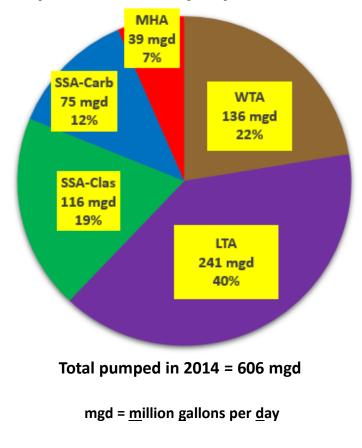
Heterogeneity

- Regional model (1,000 ft x 1,000 ft cells) may not capture local variability in aquifer properties and may not capture the response at individual wells
- Multiple wells in a single model cell
 Model aggregates all withdrawals at the center of the model cell
 Tends to exaggerate water level drawdowns: results are conservative
- Regional model results should be considered as an overall planning tool and results should not be taken as absolutes



All Pumping Wells in LWCSIM (PS, AG, REC, DSS, CI- Colored According to Aquifer)





Pumped Volumes by Aquifer - 2014

PS: Public Supply
AG: Agricultural
REC: Recreational
DSS: Domestic Self Supplied
CI: Commercial and Industrial

Allocations and Demands of Largest PS Permits (SAS/IAS)

Lee					CHARLOTTE DESOTO HIGHLANDS
	Current	2014	2040		GLADES
	Allocation	Demand	Demand	2040 - 2014	
Permittee	MGD	MGD	MGD	DIFF MGD	SWFWMD SFWMD
Lee Co. Util.Corkscrew/Green Meadows/Olga	34.27	13.74	16.24	2.50	Charlotte
Bonita Springs Utilities	5.74	3.53	5.48	1.95	Hardor A
FGUA –Lehigh Acres	3.15	2.06	3.46 *	1.40	
Citrus Park RV Resort	0.23	0.19	0.24 *	0.05	Port Labelle
Lee County Utilities - Pinewoods	7.36	1.76	1.80	0.04	
FGUA – Lake Fairways	0.101	0.10	0.10	0.00	FGUA / Lehigh Acres
Collier					Lee Co Util
Naples, City of – Utility Department	18.42	14.13	20.22 *	6.09	
Collier County – N Regional, S Regional	53.5	23.77	25.80	2.03	Immokalee
Marco Island Utilities	13.16	1.85	3.62	1.76	Bonita Springs
Ave Maria Utility Company	1.16	0.30	2.01 *	1.71	
Collier Golden Gate (fka FGUA)	2.5	1.64	0.00	-1.64	
Immokalee Water & Sewer District	4.15	1.93	2.41	0.48	Golden Gate Ave Maria
Collier County (fka Orange Tree)	0.65	0.42	0.87 *	0.45	GULFCity of Naples
Everglades City, City of	0.3	0.16	0.27	0.11	MEXICO
Port of the Islands CID	0.55	0.22	0.25	0.03	City of Naples
					Collier Co
Hendry					Collier Co
LaBelle, City of	1.06	0.36	0.01	-0.35	Marco Island
Port LaBelle Utility System	0.53	0.54	0.53	-0.01	
Charlotte					
Town and Country Utilities Company	0.78	0.00	0.78	0.78	
Charlotte Correctional	0.12	0.10	0.10	0.00	
mgd= <u>m</u> illion ga	llons per <u>o</u>	<u>l</u> ay			

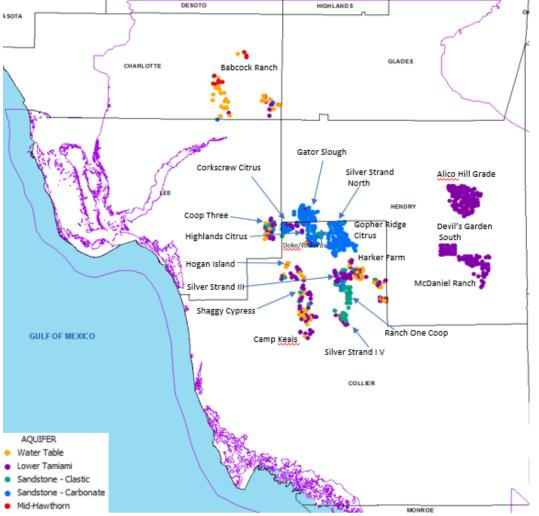
* Indicates a modeled demand over the current permitted allocation; however, it is not guaranteed to be permitted by SFWMD Water Use Bureau



Locations, Allocations, Demands of Largest AG Permits (SAS/IAS)

Charlotte				
	Allocation	2014 Demand	2040 Demand	DIFF (2040-2014
Permittee	mgd	mgd	mgd	mgd
Babcock Ranch	8.91	8.07	8.76	0.69
Collier				
Corkscrew Citrus	13.78	12.06	9.33	-2.73
Silver Strand III	8.05	5.07	4.12	-0.95
Ranch One Coop	9.36	7.30	8.01	0.71
Silver Strand North	11.48	11.06	10.38	-0.68
Highlands Citrus	7.70	4.32	3.74	-0.58
Harker Farm	12.16	10.88	10.35	-0.53
Gator Slough	16.25	13.65	14.17	0.52
Shaggy Cypress	13.43	5.40	4.92	-0.48
Silver Strand I V	6.06	6.00	5.65	-0.35
Hogan Island	10.52	5.09	5.43	0.34
Camp Keais Ag Dev	16.63	5.60	5.32	-0.28
Gopher Ridge Citrus	10.35	6.89	6.89	0.00
Hendry				
lico Hill Grade Combin	10.45	5.25	5.63	0.38
McDaniel Ranch	28.25	22.60	22.83	0.23
Devil's Garden South	7.64	6.01	6.07	0.06
Lee				
Cooperative Three Inc	7.54	1.81	1.69	-0.12

mgd=<u>m</u>illion <u>g</u>allons per <u>d</u>ay

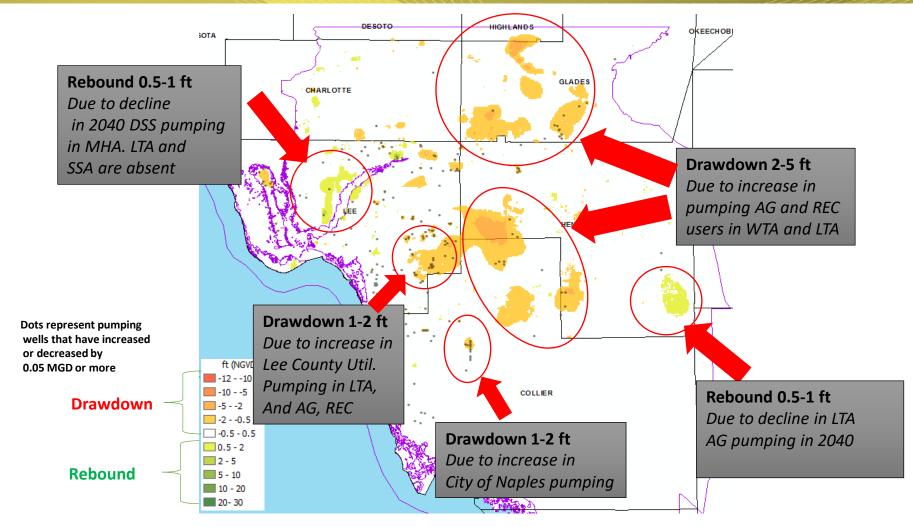


Model Results Simulated Head Differences



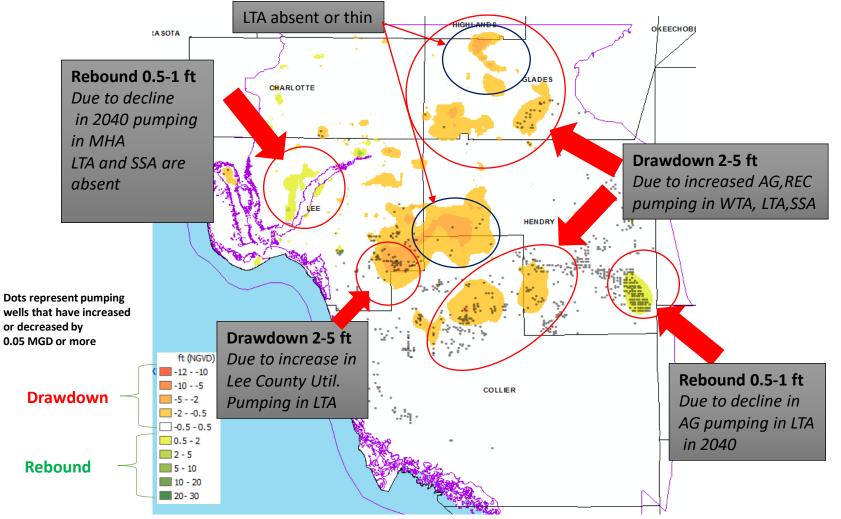


Water Level Difference: Water Table Aquifer 2040 Future – 2014 Reference Condition



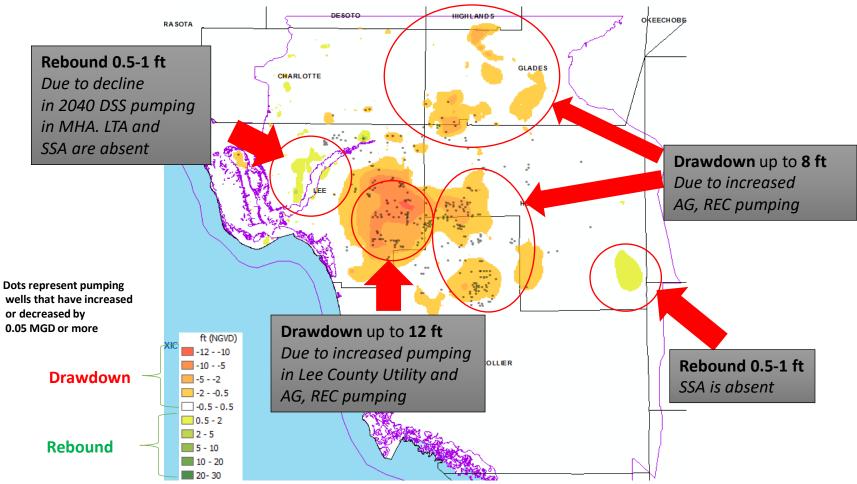


Water Level Difference: Lower Tamiami Aquifer 2040 Future – 2014 Reference Condition

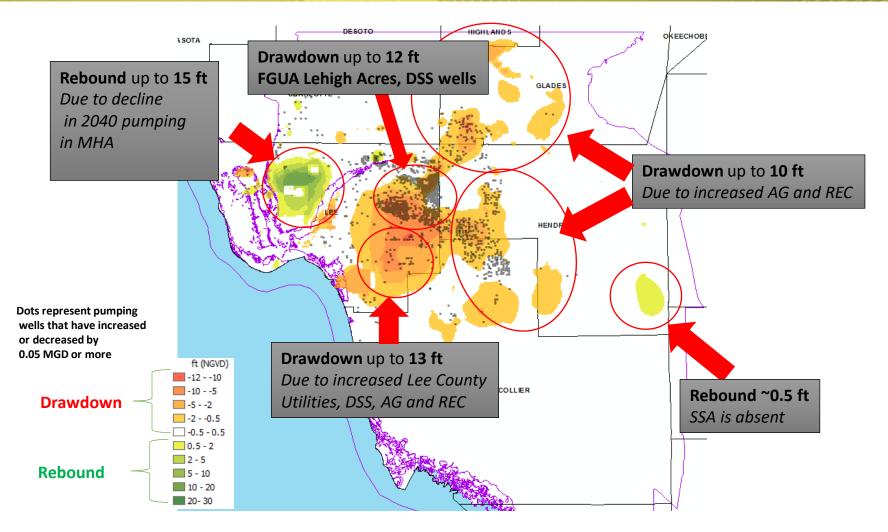




Water Level Difference: Sandstone-Clastic Aquifer 2040 Future – 2014 Reference Condition

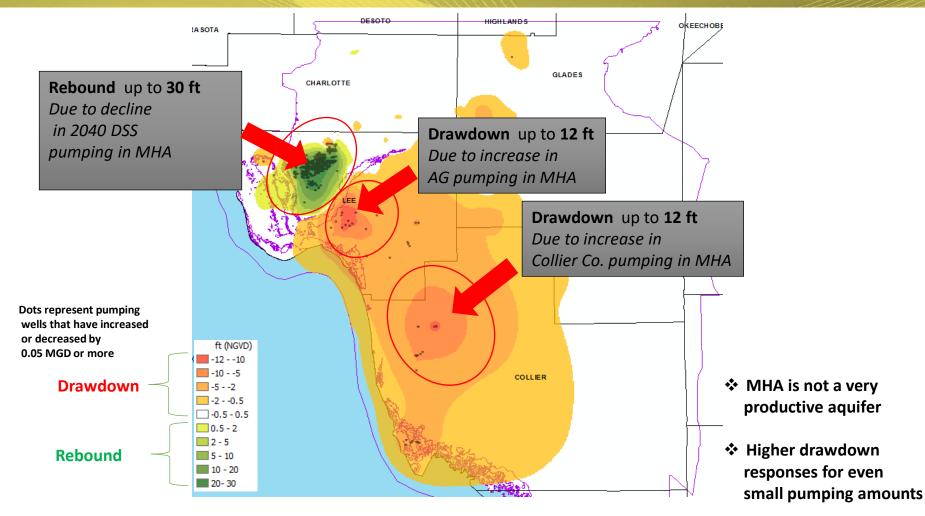


Water Level Difference: Sandstone-Carbonate Aquifer 2040 Future – 2014 Reference Condition





Water Level Difference: Mid Hawthorn Aquifer 2040 Future – 2014 Reference Condition



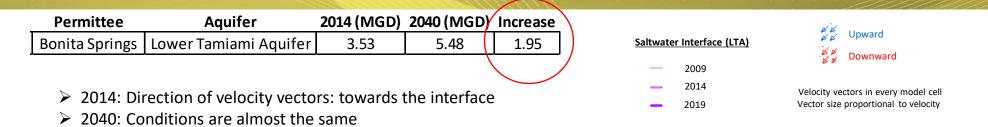
Velocity Vectors Analysis

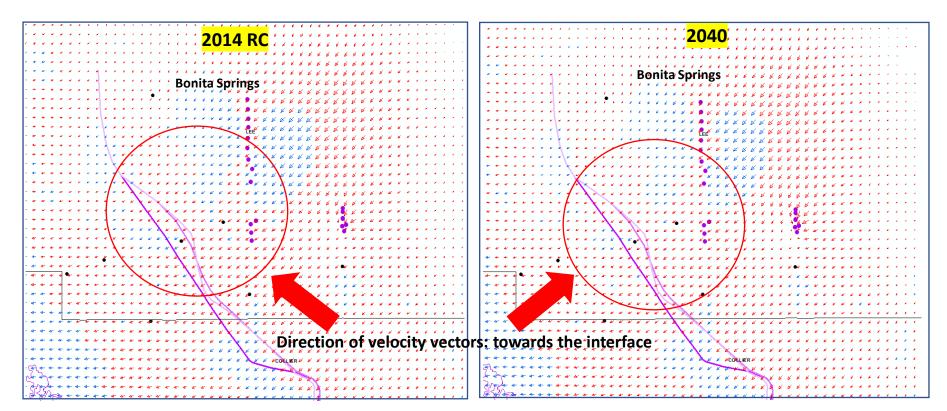
LWCSIM not a density-dependent model->cannot directly simulate saltwater intrusion nor sea-level rise

- Flow direction can be an indication of whether the flow of water is inland or towards the coast in relation to the mapped saltwater interface
- Interface positions are plotted as a reference to the wellfield locations ONLY



Velocity Vectors – Bonita Springs-LTA

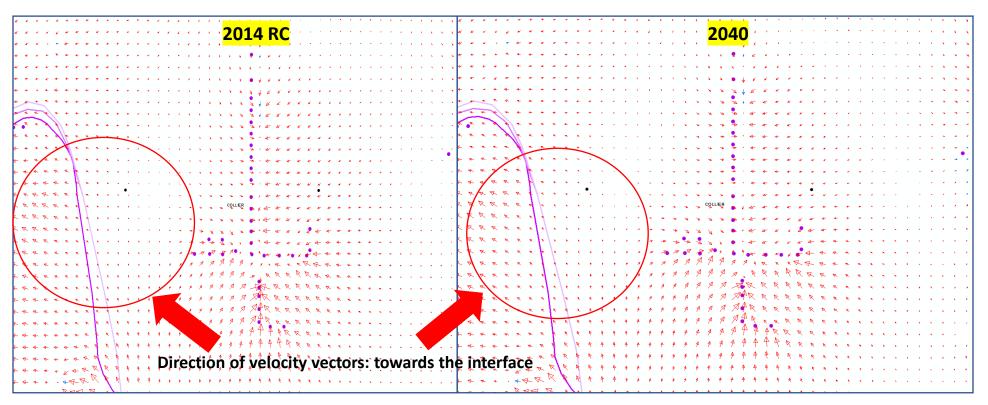






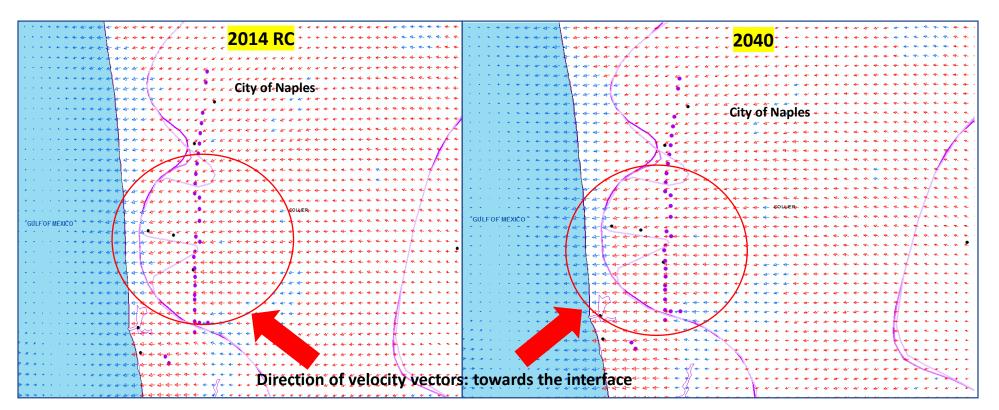
Velocity Vectors – Golden Gate-LTA

Permittee	Aquifer	2014 (MGD)	2040 (MGD)	Increase		Upward
Golden Gate	Lower Tamiami Aquifer	16.06	16.80	0.74	Saltwater Interface (LTA)	Downward
				\checkmark	2009	K K Command
▶ 201	4: Direction of velocity	vectors: tow	— 2014	Velocity vectors in every model cell Vector size proportional to velocity		
	, 0: Conditions are almos				— 2019	



Velocity Vectors – City of Naples (Coastal)-LTA

Permit No Pe	ermittee	Aquifer	2014 (MGD)	2040 (MGD)	Increase		
11-00017-W City	of Naples	Lower Tamiami Aquifer	3.75	3.78	0.03	Saltwater Interface (LTA)	🖉 🖉 Upward
					Satwater interface (LTA)	Downward	
							K B CONTRACT
	> 2014:	Direction of ve	locity ve	ectors: to	owards	2014	Velocity vectors in every model cell
>	> 2040:	Conditions are	— 2019	Vector size proportional to velocity Max vector length = 2000'			





Observations

- Velocity vectors did not change in 2040 compared to 2014 in most cases (Bonita Springs, Golden Gate, Naples)
- Not a density-dependent model, but freshwater vectors indicate no major <u>lateral intrusion</u> issues under current or proposed conditions
 - Sea-level rise would change that conclusion, as would increases in proposed pumpage



Conclusions of LWCSIM Results

LWCSIM – Regional scale, calibrated, peer-reviewed model for SAS/IAS of Lower West Coast Planning Area

- Model indicates that 2040 water demands can be met without undue impacts to natural systems
 - Water levels rebounded in Cape Coral area of MHA and Southeastern Hendry County in WTA, LTA, and SSA due to decline in projected pumping

Saltwater Intrusion Analysis

- LWCSIM is not a density-dependent model but potentially vulnerable areas for <u>lateral intrusion</u> can be identified using velocity vectors
- Freshwater velocity vectors indicate no major <u>lateral intrusion</u> issues under current or proposed conditions



West Coast Floridan Model (WCFM)

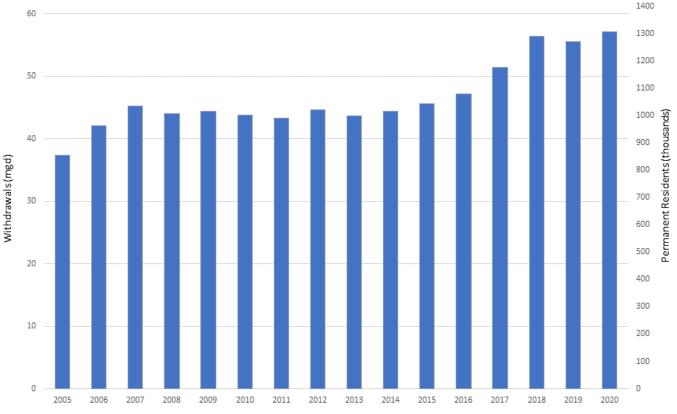


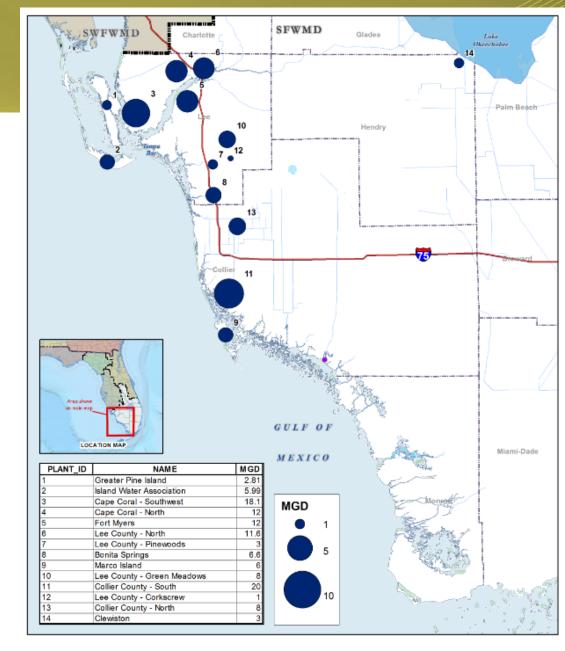


SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Brackish Water from the Floridan Aquifer System

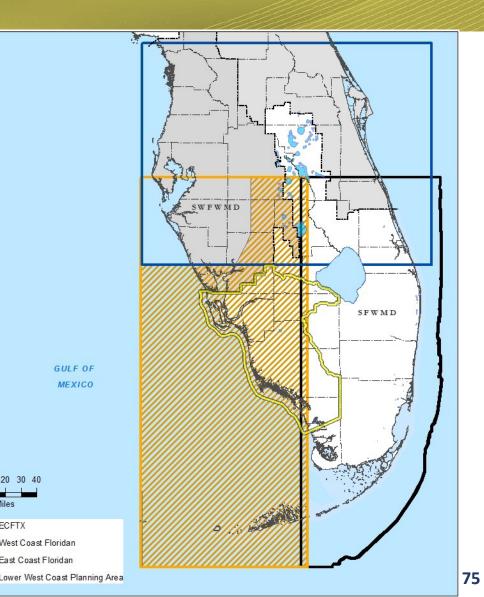
- Currently, 14 facilities, 120 mgd capacity, reverse osmosis (RO) treatment
- Increase in development through 2040





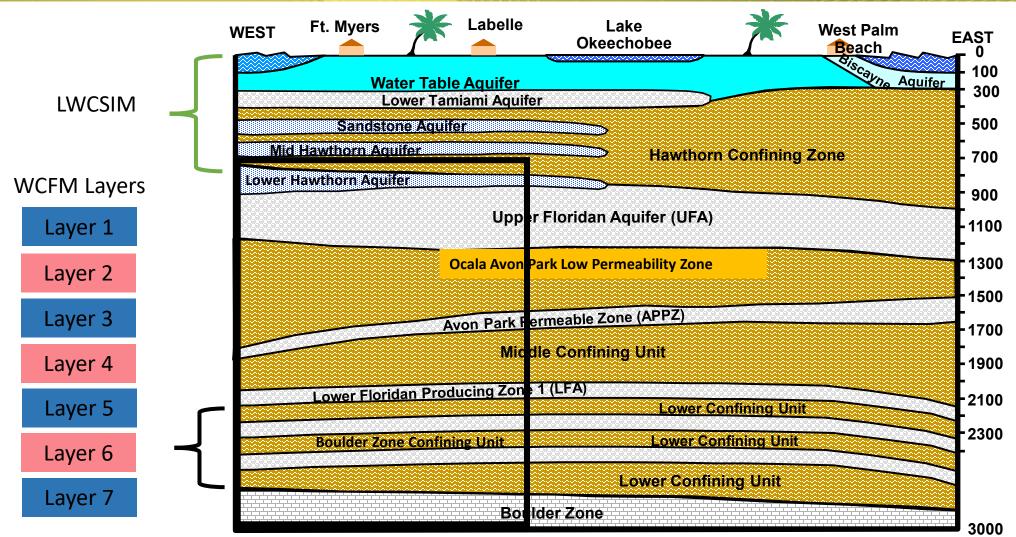
West Coast Floridan Model

- SEAWAT model (USGS, 2012)
- Period of record: 1989-2012
- Monthly simulation periods
- ➤ Cell size: 2,400 ft × 2,400 ft
- Calibrated to water levels and water quality (Total Dissolved Solids [TDS])





WCFM Aquifers and Model Layers



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WCFM Application

➤ 2014 base condition

- Public supply demands from historical pumpage data
- Agricultural and recreational/landscape demands estimated based on AFSIRS (simulates irrigation demands)
- Industrial demands from permitted allocations
- Areas overlapping the ECFTX Model domain have demands consistent with the Central Florida Water Initiative regional water supply plan

2040 future condition

- Public water supply, agricultural, and recreational/landscape demands from planning projections
- Industrial demands from permitted allocations
- Areas overlapping the ECFTX Model domain have demands consistent with the 2040 projections in the Central Florida Water Initiative regional water supply plan
- 2040 projected demands are simulated starting at the initial condition

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Public Supply FAS Demands

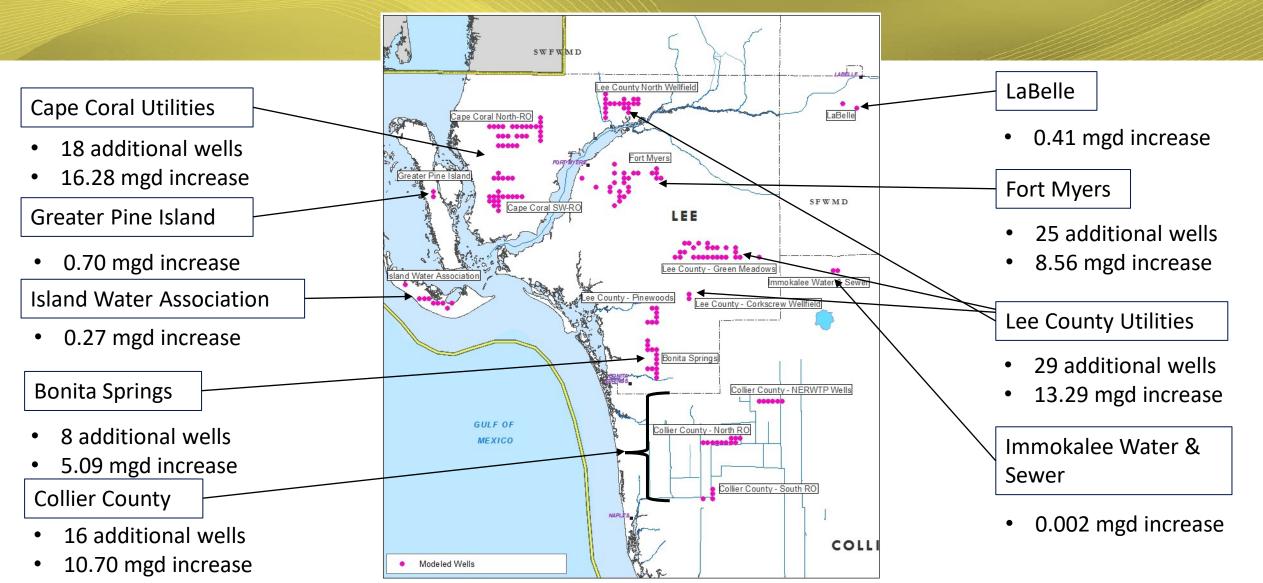
County	Permit Number	Utility	FAS Allocation (mgd)	2014 (mgd)	2040 (mgd)	Difference (mgd)
Lee	36-00046-W	Cape Coral Utilities	39.25	11.32	27.60	16.28
	36-00035-W	City of Fort Myers	15.25	8.93	17.49*	8.56
	36-00003-W	Lee County – Corkscrew/Green Meadows/Olga	14.21	0.27	13.57	13.29
	36-00152-W	Lee County Utilities – North	16.13	5.00	10.98	5.98
	36-04062-W	Bonita Springs Utilities	13.07	5.61	10.69	5.09
	36-00122-W	Lee County Utilities – Pinewoods	4.90	2.24	6.15*	3.91
	36-00034-W	Island Water Association	4.96	4.43	4.70	0.27
	36-00045-W	Greater Pine Island	2.49	1.54	2.24	0.70
		Total Lee County Demand	110.26	39.34	93.42	54.08
Collier	11-00249-W	Collier County North & South Regional	19.52	3.42	14.12	10.70
	11-00013-W	Immokalee Water & Sewer District	0.70	0.00	0.002	0.002
		Total Collier County Demand	20.22	3.42	14.122	10.702
Hendry	26-00105-W	Labelle Public Water Supply	1.06	0.33	0.74	0.41
		Total Hendry County Demand	1.06	0.33	0.74	0.41

* Indicates a modeled demand over the current permitted allocation; however, it is not guaranteed to be permitted by SFWMD Water Use Bureau

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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

2040 Public Supply FAS Wellfields



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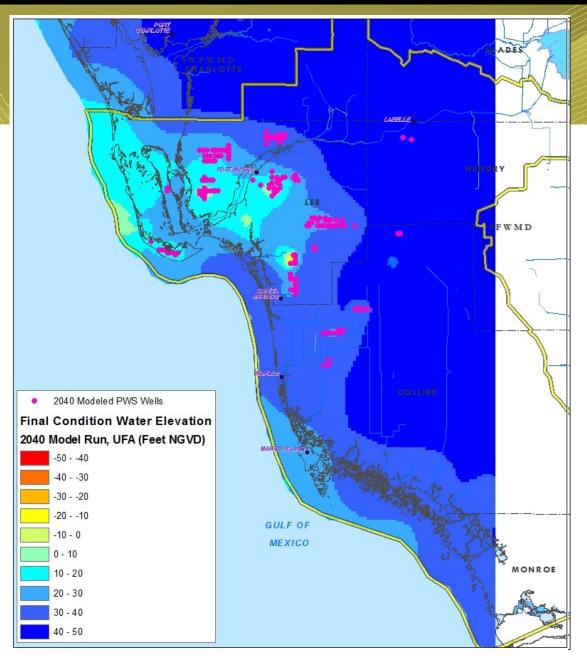
Interpreting the Results

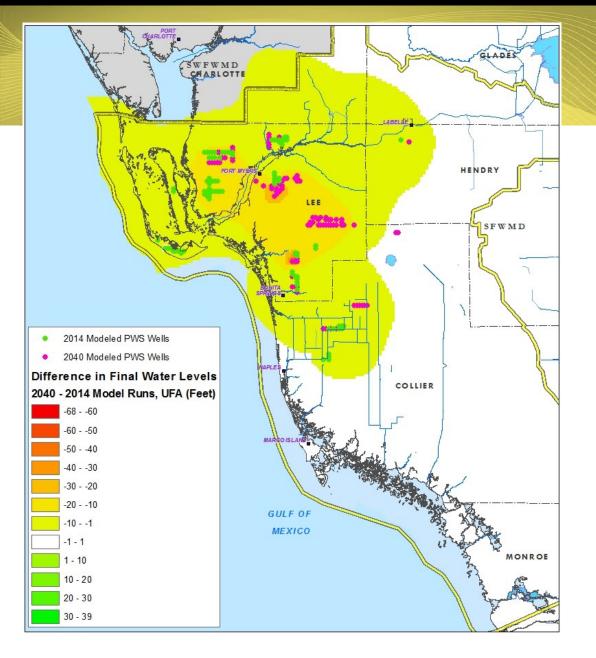
➢ Model run

- 2014 final condition
- 2040 final condition
- (2040 2014) final condition difference map

> Layer

- UFA
- APPZ
- ➢ Well symbol
- Units and scale
 - ft, mg/L, ft³/d



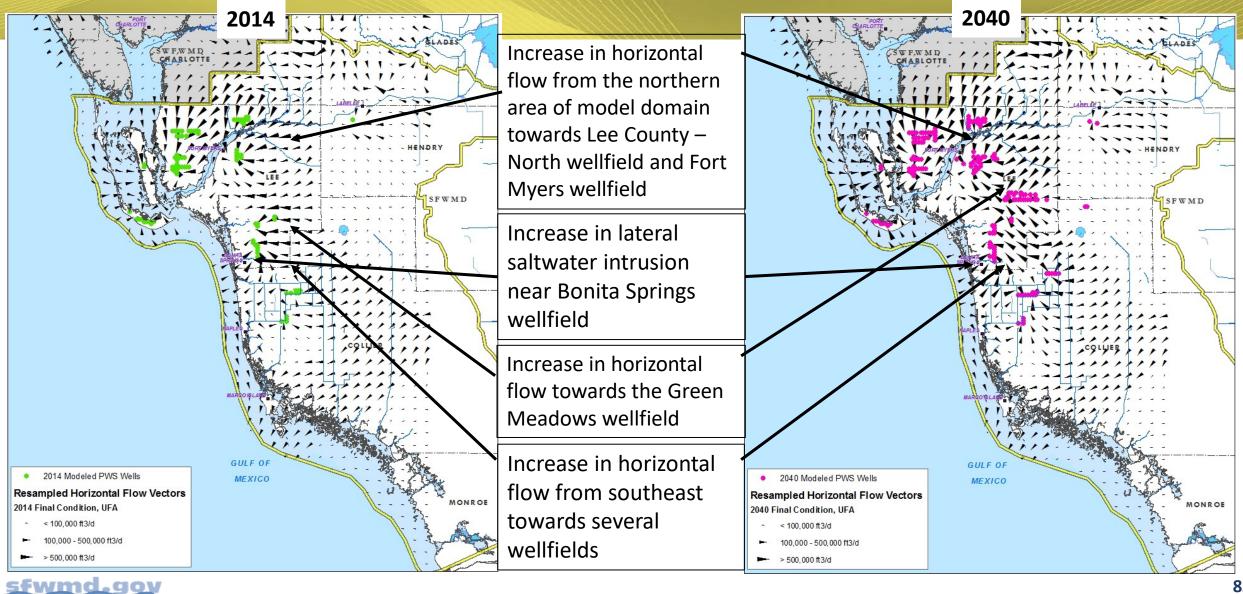


UFA Water Level Difference

- (2040 2014) final condition water level difference
- 20-35 ft of additional drawdown at Cape Coral
- 20-30 ft of additional drawdown at Fort Myers
- Average drawdown at Lee County Pinewoods approximately 40 ft, with maximum drawdown of 68 ft



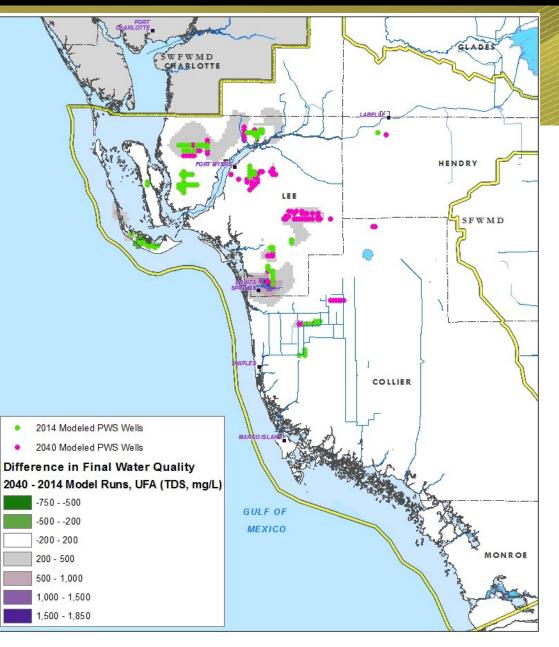
UFA Horizontal Flow Vectors

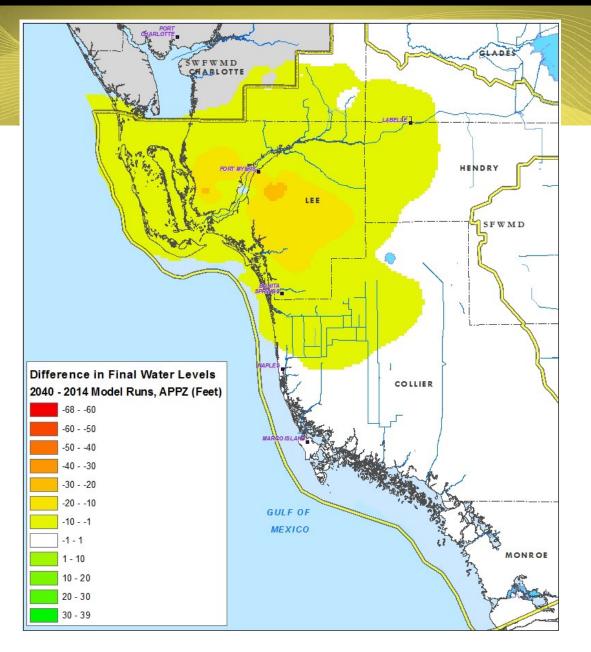


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UFA Water Quality Difference

- (2040 2014) final condition water quality difference
- Total dissolved solids (TDS) degradation at Cape Coral and Lee County North is <500 mg/L</p>
- TDS degradation at Green Meadows wellfield is <700 mg/L</p>
- TDS degradation at Pinewoods wellfield is <1,000 mg/L</p>
- TDS degradation at Bonita Springs wellfield is <2,000 mg/L</p>

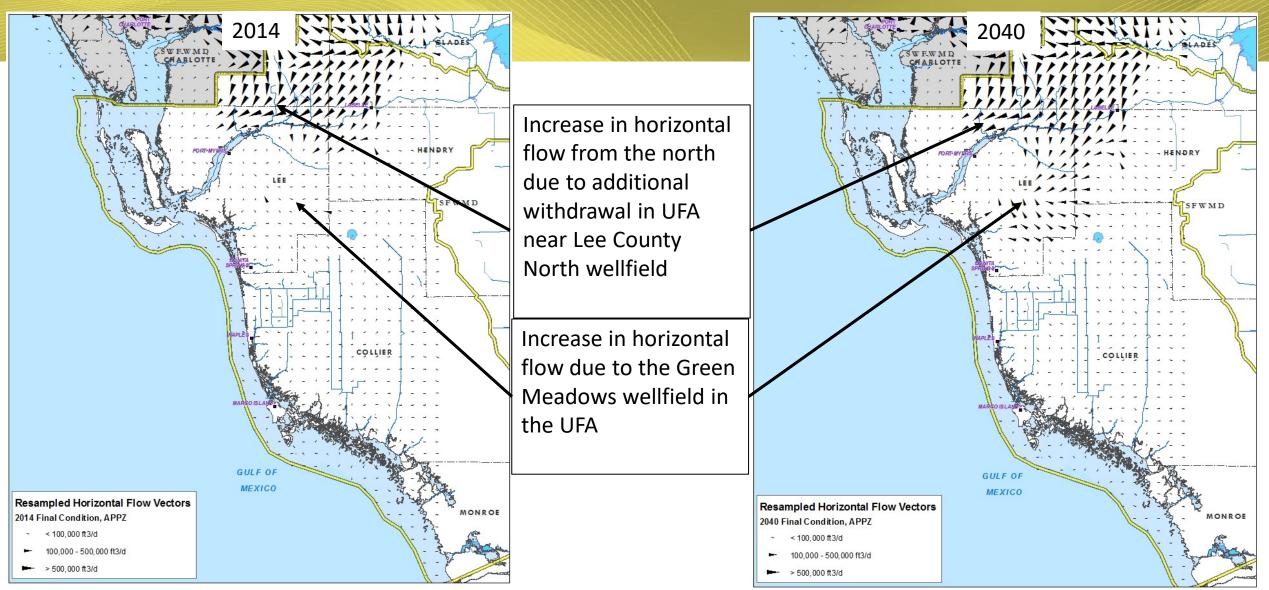




APPZ Water Level Difference

- (2040 2014) final condition water level difference
- 25 ft of additional drawdown at Cape Coral due to increased withdrawals from the UFA
- 22 ft of additional drawdown at Fort Myers due to increased withdrawals from the UFA

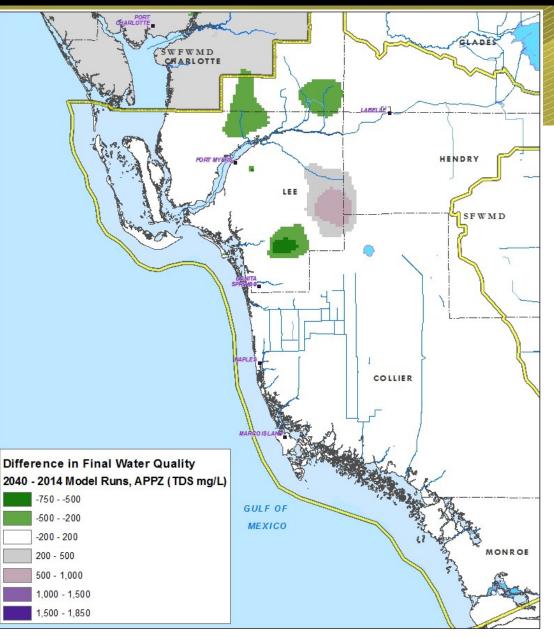
APPZ Horizontal Flow Vectors



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

APPZ Water Quality Difference

- (2040 2014) final condition water quality difference
- TDS degradation between 200 and 1,000 mg/L near Lee County's Green Meadows wellfield

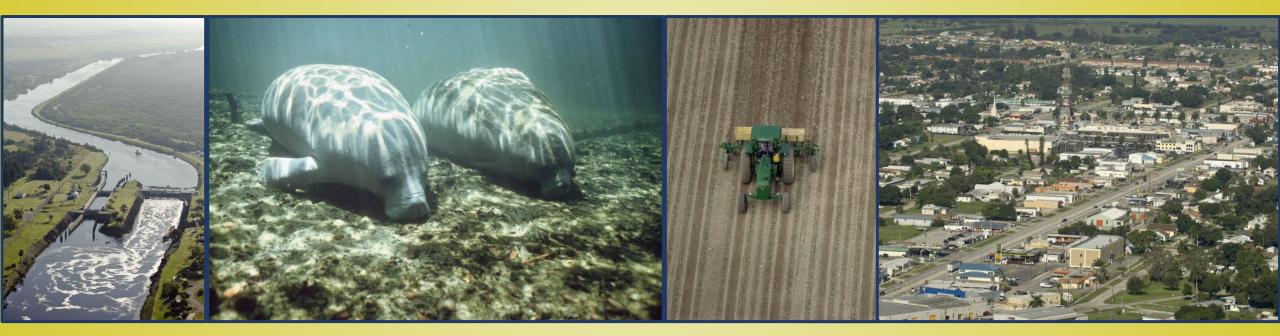


Conclusions of WCFM Results

- Spatial expansion of wellfields in Fort Myers and Cape Coral, combined with lateral recharge from the northeast, minimized drawdown impacts despite significant increase in demands. Wellfield expansion also minimized potential water quality degradation.
- Although Lee County Pinewoods increases the number of production wells, the wells are clustered, which accounts for 20 to 68 ft of additional drawdown in the area. The utility has a demand increase of 3.91 mgd.
- Water quality degradation in Bonita Springs is a result of lateral saltwater intrusion and lateral movement of water from northern Collier County, which has higher salinity.
- Based on planning projections, with wellfield management, the 2040 model results do not indicate a significant adverse impact to groundwater levels and quality, indicating prolonged use of the FAS is sustainable.

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

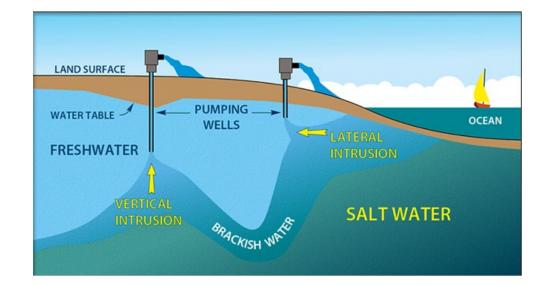
Five-Year Saltwater Intrusion Mapping Update





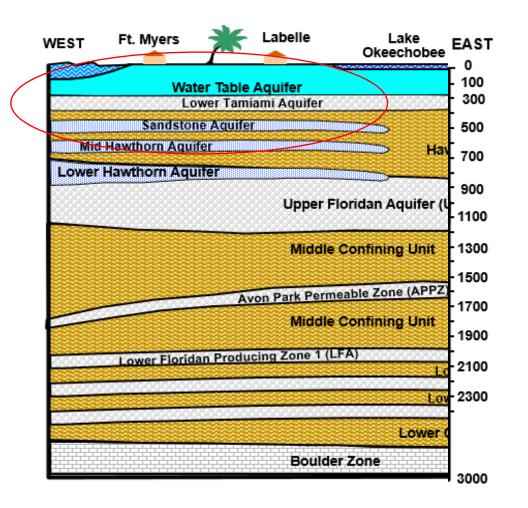
Common Sources of Saltwater Intrusion

- Lateral intrusion from the coast
- Vertical Intrusion (upconing from saltwater below)
- Surface Infiltration estuaries, boat basins, saltwater marshes, saltwater canals, etc.
- Ancient (relict) seawater trapped in low permeability aquifers





Generalized Hydrogeology, Lower West Coast





Why Is This Important?

- Wellfields are a major water supply source – protect water resource and investment
- Once saltwater enters wells, very difficult if not impossible to reverse
- Very expensive to relocate wellfields and associated infrastructure (pipelines, treatment plants and processes, etc.)
- Other sources of water more expensive to treat (e.g., Floridan aquifer – reverse osmosis)





SFWMD Saltwater Interface Mapping Project

- Strategy Compare interface positions (i.e., 2009, 2014, 2019), note areas of concern, and adjust monitoring as necessary
- Update Maps Every 5 Years
- > Use all available data (USGS, SFWMD, Counties, Water Use Permittees)
- Furthest Inland Extent Dry Season
- > Maximum chloride value March/April/May 2019 (with some exceptions)
- > 250 milligrams per liter (mg/L) chlorides Drinking water standard
- Coastal aquifers: Water Table (Biscayne aquifer), Lower Tamiami, Sandstone, Mid-Hawthorn





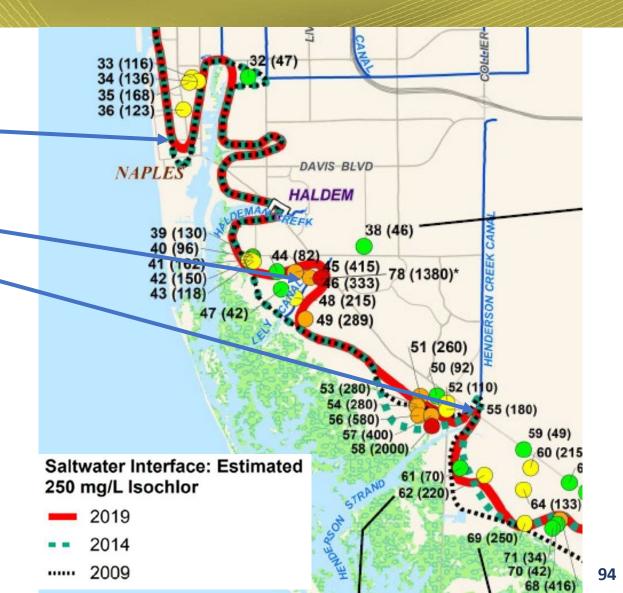
Structures		Chloride Concentration	Saltwater Interface: Estimated		
T	Culvert	● ≤ 100 mg/L	250 mg/L Isochlor		
M	Lock	101 - 250 mg/L	2019		
ð	Pump	251 - 1,000 mg/L	- 2014		
ப	Spillway	> 1,000 mg/L	2009		
Δ	Weir	Chloride Labels	Wellfields		
	Roads	I (135)	Freshwater Bodies		
		Map (Chloride)	Saline Water Bodies		
			Mangrove & Saltwater Marshes		



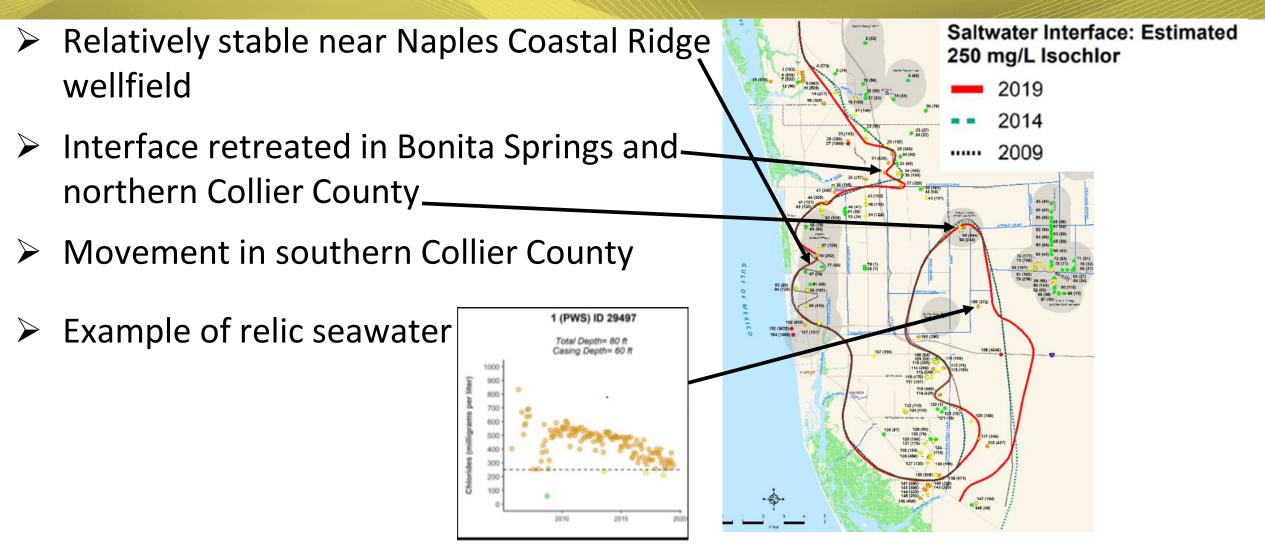
Water Table Aquifer-Collier County

- Relatively stable in the Naples area
- Inland movement observed near Lely Canal and Henderson Creek area
- New development proximal to coast. Surface water is tidal and ranges from fresh to saline. Permittees monitor for chloride concentration in groundwater

sfwmd.gov



Lower Tamiami Aquifer - Lee & Collier Counties



Conclusions

- Water Table Aquifer Noticeable inland movement in Lely Canal and Henderson Creek areas
- Lower Tamiami Aquifer Interface retreated in northern Lee and southern Collier counties; advanced in southern Collier County
- Interface is dynamic advanced and retreated, depending on wellfield pumpage, reclaimed water use, tidal, sea-level rise, etc.
- Saltwater intrusion is occurring, emphasizing the importance of continued monitoring (laterally and vertically) and wellfield management
- Additional, localized monitoring may be required at select projects and wellfields by permittees to protect water supplies

sfwmd.gov

2009, 2014 & 2019 maps available: <u>https://www.sfwmd.gov/documents-by-</u> <u>tag/saltwaterinterface</u>

Merged Isochlor 2019: <u>https://geo-sfwmd.hub.arcgis.com/datasets/merged-isochlor-2019</u>

Chloride Data, 2019: <u>https://geo-sfwmd.hub.arcgis.com/datasets/chloride-data-2019</u>



Thank You

Peter J. Kwiatkowski, P.G. Section Administrator, Resource Evaluation <u>pkwiat@sfwmd.gov</u>

Questions and Public Comment



If you are participating via <u>Zoom</u>:

- Use the Raise Hand feature
- If you are participating via <u>phone</u>:
 - *9 raises hand
 - *6 mutes/unmutes your line
- When you are called on, please state your full name and affiliation prior to providing comments and/or questions.

Estero Bay



Resiliency Updates



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

2022 LWC Stakeholder Meeting 2

May 25, 2022



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Overview

Understanding our resiliency through Data & Modeling
 District efforts that enhance the resiliency of our water supply
 Vision for the future

Water and Climate Resilience Metrics Hub



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.

Objectives

As part of a service of Distric Reliance, initiatives to adaptes changing conditions, the District is implementing as of vieware and climate relience metric distributed. These science-based metrics are being devolved with the goal initiational and an advectional transformation and an advectional data, supporting the assessment of current and future climate condition scenarios and related operational decision, and informing District resiliency investment priorities. As purt of the District's communication and public anggement priorities, this effort informs statistications, and existing advectional decisions, and informing District resiliency investment priorities. As purt of the District's communication and public anggement priorities, this effort informs statistications and data analysis results, as well as related information that elevants to the control 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

Emerging Trends in Regional Resiliency



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

Saltwater Intrusion in Coastal Aquifers The inland migration of saltwater poses a threat to water supply and critical freshwater

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



Salinity in the Everglades Estuarine and Mangrove Inland Mgration The salinization of previously freshwater systems poses threats to several factors.



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

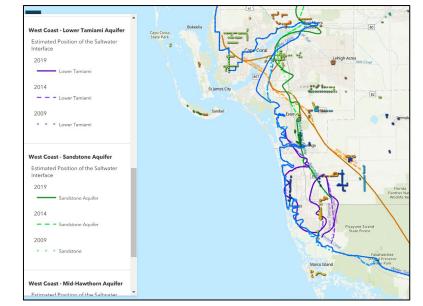


Saltwater Intrusion Cross-Section A

(A) East-west cross section A to A' through the southern portion of the City of Naples Coastal Ridge well field, Collier County.

(B) Cross section A to A': Map includes monitoring wells active in 2007 and inactive USGS monitoring wells located within 0.65 mi of the axis of the cross section.

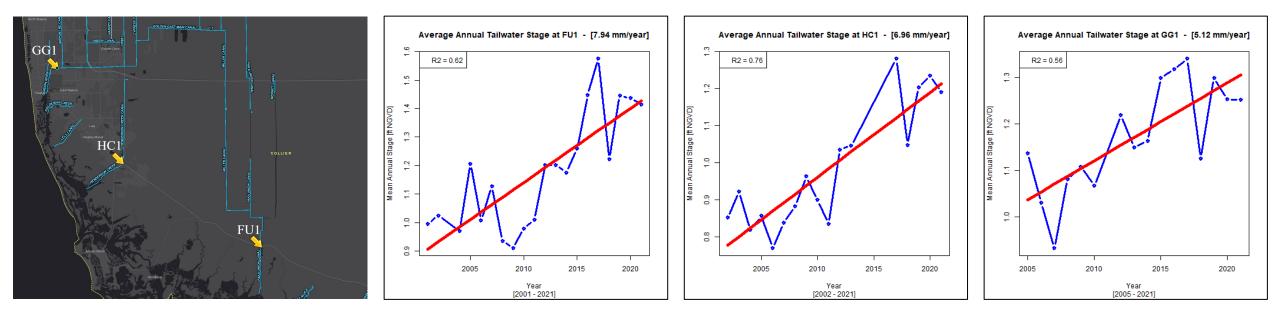




Saltwater intrusion cross-section and map featured on the <u>Water and Climate Resilience Metrics Hub</u>

sfwmd_gov sfwmd.gov/our-work/water-and-climate-resilience-metrics

Observations – Tailwater Stages

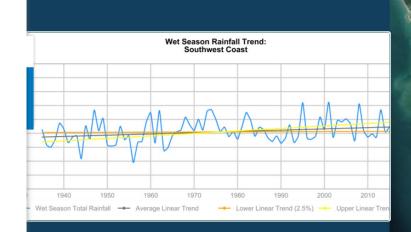


Average annual tailwater stage at selected stations along South Florida's west coast. (Blue line is the average annual tailwater stage. Red line is the linear trend of average annual tailwater stage.)

stwmd.gov

Observations – Average Wet Season Rainfall

Southwest Coast Rainfall Trends featured in the Water and Climate Resilience Metrics Hub



Southwest Coast Rainfall Trends

Trend analyses of average rainfall during the wet season in the Southwest Coast rainfall basin shows a statistically significant upward trend.

> Wet Season Rainfall Trend: Upper Kissimmee

> > ×

1 A A

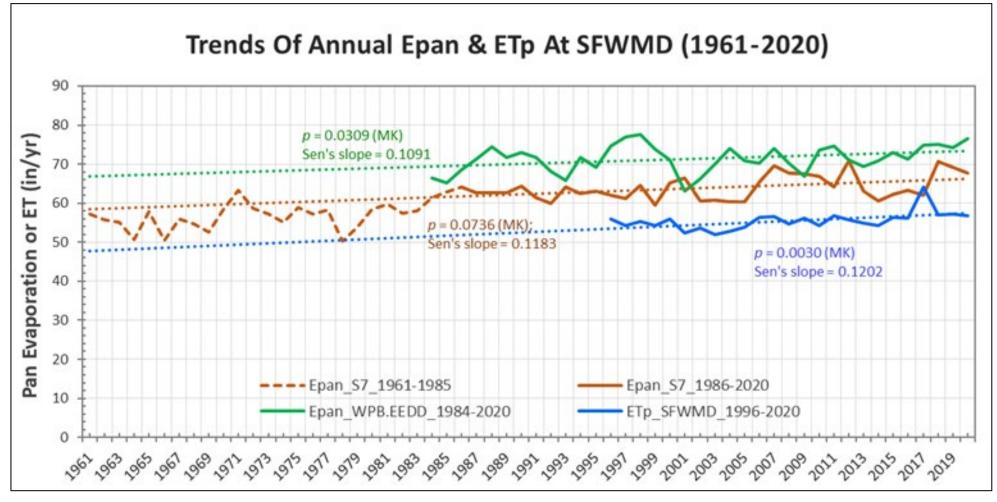
SOUTHWEST COAST

EAST CALOOS

https://sfwmd-district-resiliency-sfwmd.hub.arcgis.com/

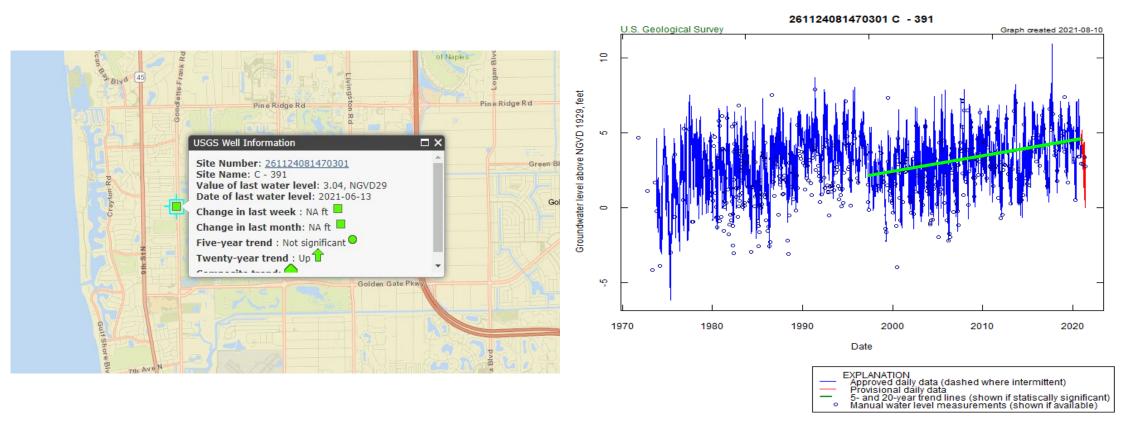
sfwmd.gov

Observations – Evapotranspiration



https://sfwmd-district-resiliency-sfwmd.hub.arcgis.com/

Observations – Groundwater Stages

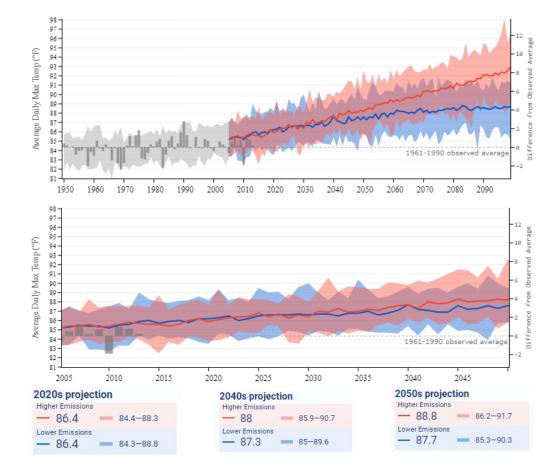


USGS well data showing groundwater stages where we can see an upward trend.

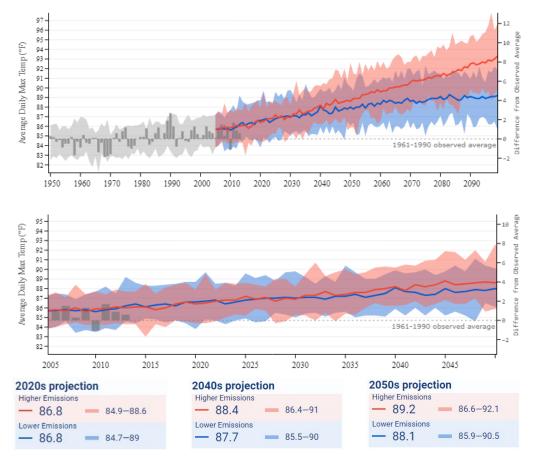


SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Projections – Temperature Changes

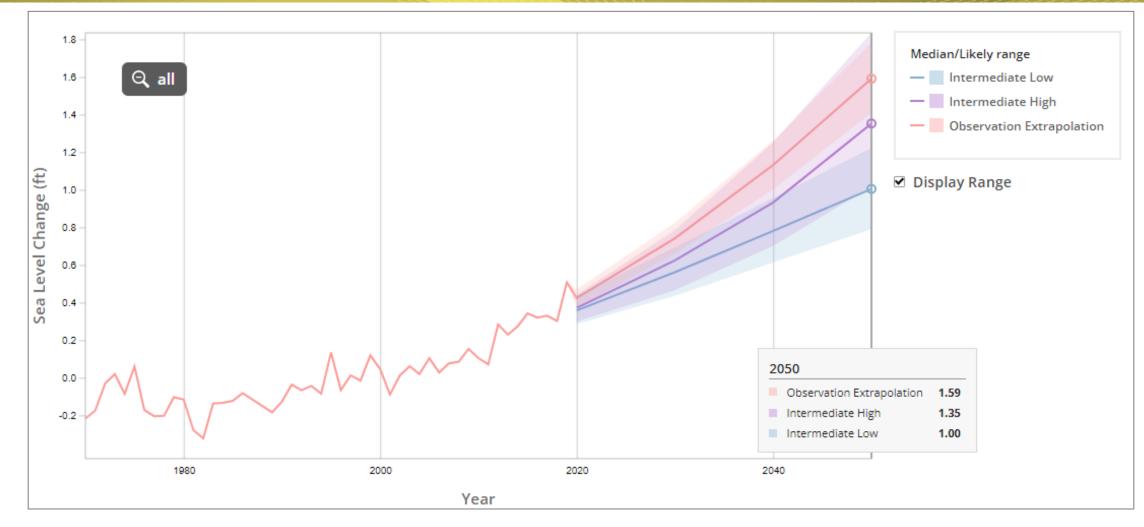


Projected average daily maximum temperature in Lee County (The Climate Explorer 2022, NOAA)



Projected average daily maximum temperature in Collier County (The Climate Explorer 2022, NOAA)

Projections – Sea Level Rise



sfwmd_gov

Future Sea Level Rise Projections for Fort Myers and Naples (2022 NOAA Projections, NASA)

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

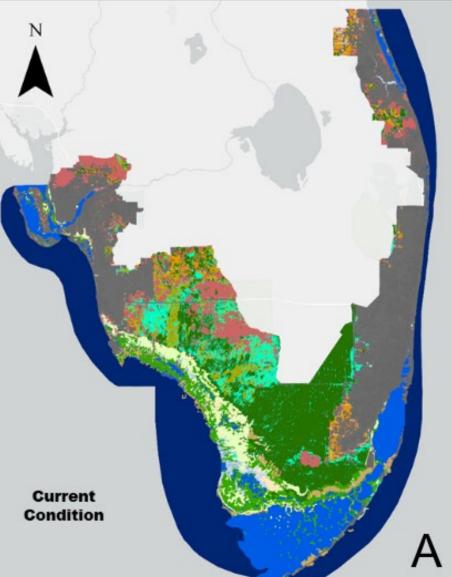
Sea Level Rise Inundation

"Bathtub" Model of Saltwater Intrusion

Sklar, F.H., C. Carlson, C. Coronado-Molina, and A.C. Maran. 2021. Coastal ecosystem vulnerability and sea level rise (SLR) in South Florida: A mangrove transition projection. Front. Ecol. Evol. 9:646083. doi: 10.3389/fevo.2021.646083

> Habitat Transition with an Accretion Rate of 4.2 mm yr-1 (0.211 m by 2070). Agriculture Palustrine Marsh Barren Land Palustrine Swamp Estuarine Water Saltwater Marshes Saltwater Ponds Mangrove Swamp Terrestrial Marine Tidal Flats Open Water Palustrine Cypress 🔲 Urban

sfwmd.gov

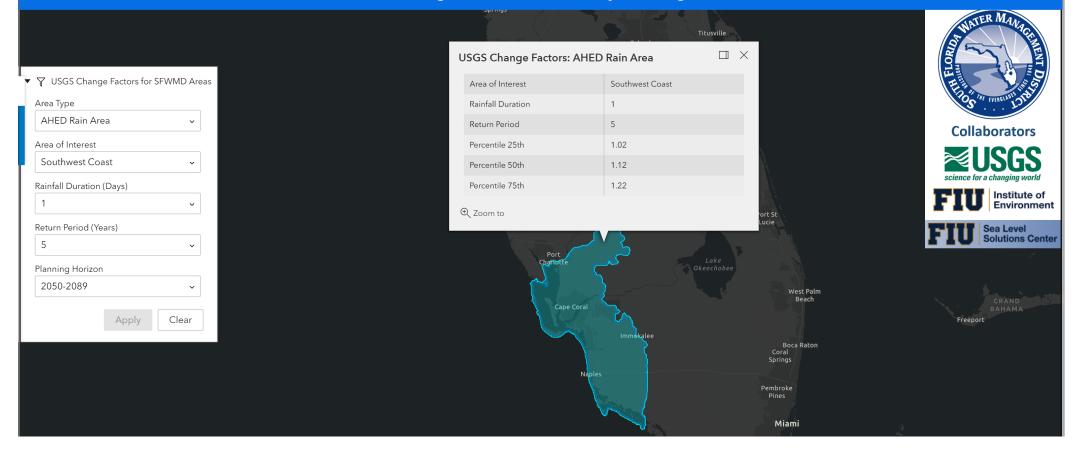


SLR of 0.76 m (2.5 ft)

2.5 feet / 0.76 m NAVD 2070 Sea Level Rise Prediction 0.211 m Accretion

Projections – Extreme Rainfall

Extreme Rainfall Change Factors for Resiliency Planning in South Florida



Web App Link:

sfwmd.gov

https://sfwmd-district-resiliency-sfwmd.hub.arcgis.com/apps/future-extreme-rainfallchange-factors-for-flood-resiliency-planning-in-south-florida/explore

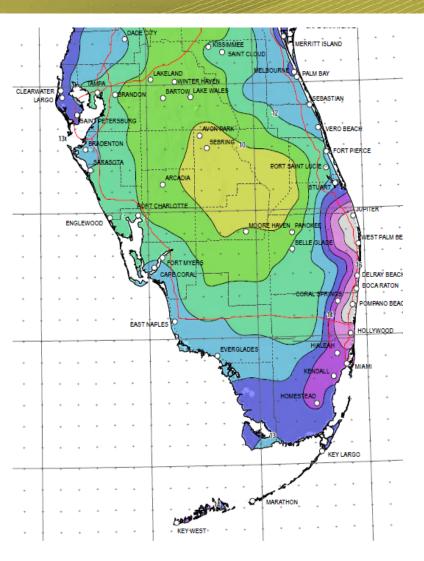
Technical Memorandum Link:

https://apps.sfwmd.gov/sfwmd/gsdocs/TPubs/2022_SFWMD_TM_Adoption_of_Future_ Extreme_Rainfall_Change_Facotrs_for_Resiliency_Planning_in_South_Florida_rev2.0.pdf

Estimating Future Rainfall

- SFWMD partnership with USGS & FIU
- Global climate model downscaling datasets
- Review of the latest science and refined evaluation of predicted rainfall
- Estimate **change factors in extreme rainfall** by 2070, districtwide, compared to NOAA Atlas 14 observations
- Develop **future intensity-duration-frequency curves** for the 16-counties area
- Strengthen District's planning capacity

<u>Change factors to derive projected future precipitation depth-duration-frequency (DDF)</u> <u>curves at 174 National Oceanic and Atmospheric Administration (NOAA) Atlas 14 stations in</u> <u>central and south Florida - ScienceBase-Catalog</u>



Planning for Climate Change Sea Level Rise

- Commitment to determine the best short- and long-term strategies for water resource management
- Continue to develop and improve data analysis, surface and ground water, coastal and inland, with focus on saltwater intrusion
- Advanced groundwater models being designed to support the evaluation of sea level rise and climate change scenarios, anticipate demand and availability impacts and simulate future saltwater inland movement.
- To be expanded to the Lower West Coast planning region for subsequent water supply plans
- Incorporation of future project recommendations as part of the District's Resiliency Plan



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

"...hard to recognize, but there used to be a canal somewhere in the foreground." – Merritt Canal Plugged

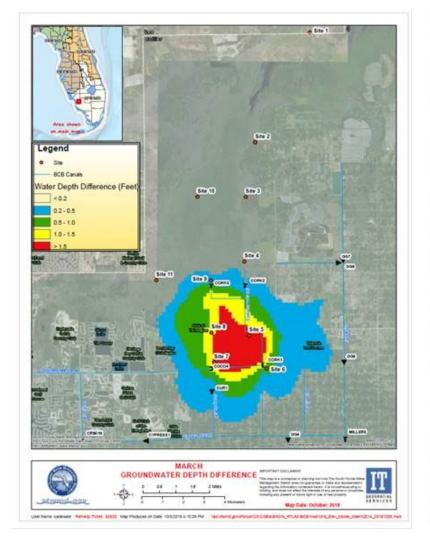
Ecosystem **Restoration supports** mitigation against sea level rise and other impacts from a changing climate.

CERP goals are aligned with the adaptation strategies needed to build Resiliency in South Florida.

Updated Structures at Big Cypress Basin

Updated Structures at Collier County/Big Cypress Basin are holding more water back, keeping groundwater tables higher, protecting inland wetlands and water supply, maintaining downstream salinity, and reducing late dry season wildfire risks:

- 8 structures (past 10-15 years)
- CYP1 currently
 under construction
- CUR1 increased late dry season (average March) water table by over 1.5 ft





Everglades Mangrove Migration Assessment Study

- NEED: Increases in sea level rise (SLR) rate and saltwater intrusion contribute to the collapse of marsh peat soils. Without sufficient freshwater restoration, landward migration of mangroves will be hindered by reducing seedling establishment in deeper, sulfide-rich water
- GOAL: Increase coastal zone functionality in face of SLR through understanding of biological vs. physical controls on capacity of coastal (marl-forming) wetlands to persist under increased SLR, using thin layer placement



Adaptive Foundational Resilience is the ability of the foundational vegetation (marsh and mangrove) to adapt to sea level rise by building elevation as a function of water depth, salinity and flow.

> Sriffine, Gasspecht Sandsar: Gasspecht Sarvisar is a unit utildn the Sriffin Flackb Within Johns gamaat bleithefte information Taelanobyy Shendi (T1). Gasspithel Barl van manager and mithiolise entraprise passpithelanvisas jaselteite, and debt nack gavannad bytke ITPP Problem out Providingr. Network End. Utytelohide, Baselpe, Bartito Gasergabae, RUEBKahine D.R. USBA, U.SBA, U.SBA, AsseSR10, JOH, and th eR Ung 5 sammula:

Inundation Map Representing USACE SLC Intermediate and High Curves Assuming 50year Planning Horizon to Year 2080, Absolute Elevations of 0.67 ft. and 2.85 ft. NAVD88, Respectively. Coastal Structures with Bypass Elevation (ft. NAVD88) for Reference.



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Flood Protection Level of Service Program

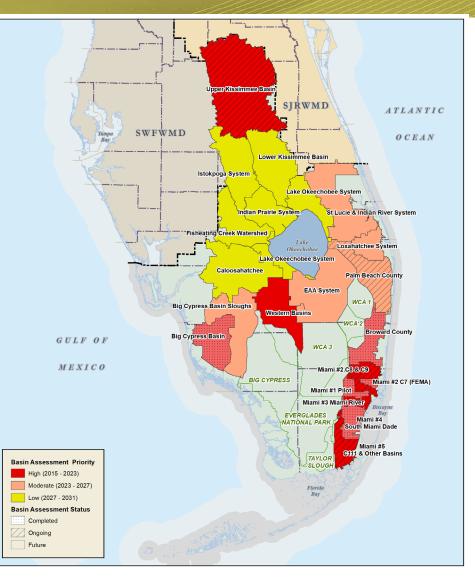
From Data Analysis to Robust Hydrology & Hydraulics Modeling Assessments

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



Our Resiliency Vision

Risk Reduction / Effectiveness

Implementation Resources

Anticipated Future Conditions

Critical Infrastructure and Disadvantaged Population Impacted

Public Engagement & Leveraging Partners

Ongoing Ecosystem Restoration Efforts

Innovative Green/Nature-Based Solutions

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



Draft Version 2.2

September 2021

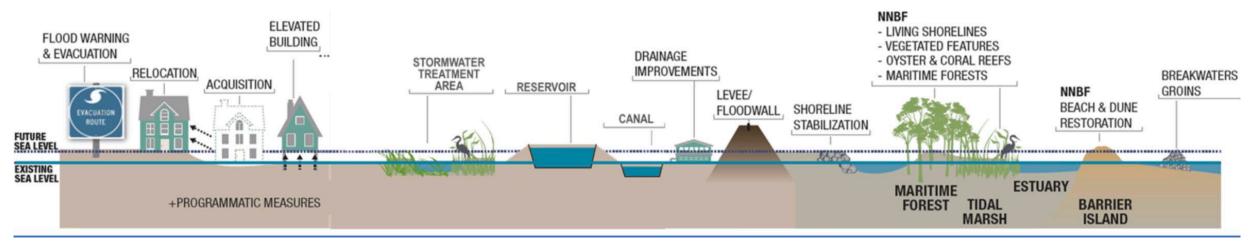
Resiliency Initiatives Coordination Integrating Inland and Coastal Flood Mitigation Strategies

Counties Projects	Local Municipalities Projects	USACE Studies/ Projects	Regional Climate Compacts	Other Partners
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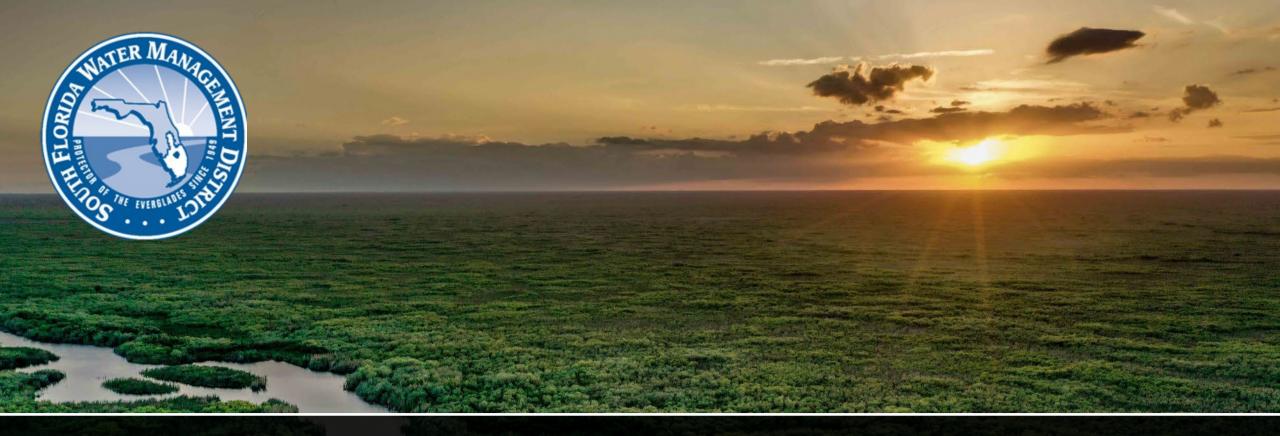
POTENTIAL MEASURES TO IMPROVE RESILIENCE AND SUSTAINABILITY

sfwmd.gov

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



Source: USACE



Thank You

Carolina Maran, P.E., Ph.D., SFWMD, District Resiliency Officer <u>cmaran@sfwmd.gov</u> <u>www.sfwmd.gov/resiliency</u>

Photo by Paul Krashefski

Questions and Public Comment



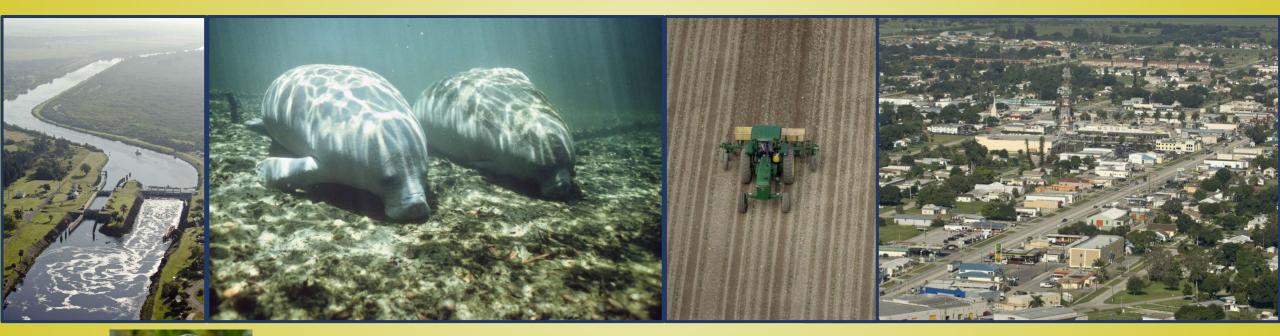
Caloosahatchee River Fort Myers

If you are participating via <u>Zoom</u>:

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 - *9 raises hand
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Next Steps



Bob Verrastro, P.G.



Principal Hydrogeologist, LWC Water Supply Plan Manager

2022 LWC Stakeholder Meeting 2 May 25, 2022

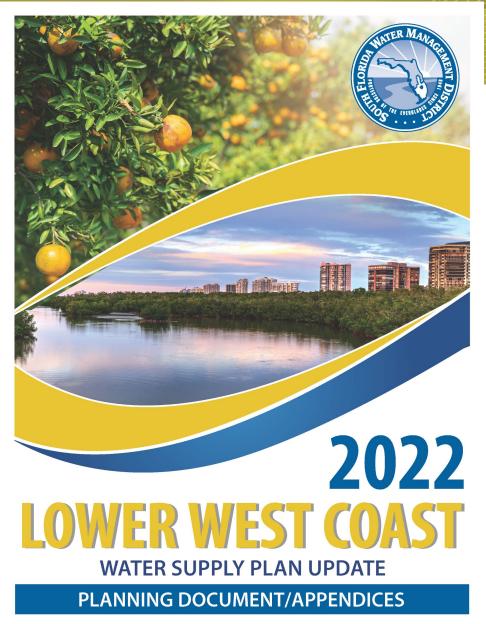


Draft Chapters Are Available for Public Comment

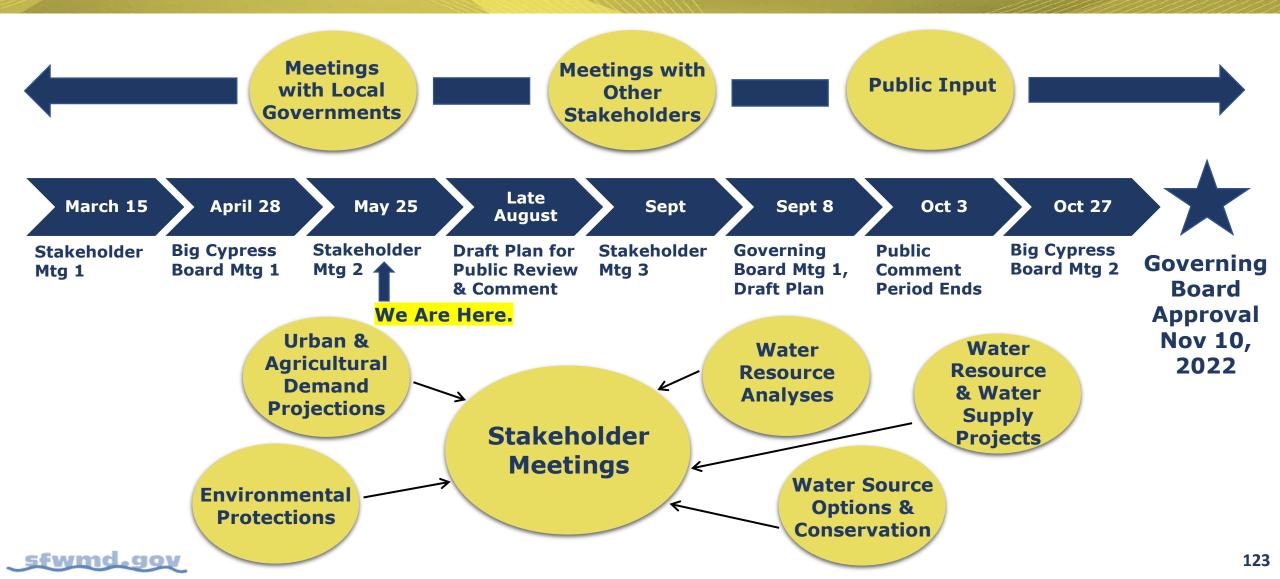
- Draft versions of Chapters 1, 3, and 4 of the 2022 LWC Plan Update are now available for early viewing and comment at <u>www.sfwmd.gov/lwcplan</u>.
- Please submit your written comments to Bob Verrastro, LWC Plan Update Manager, at <u>bverras@sfwmd.gov</u> by Wednesday, June 8, 2022.
- We strongly encourage your input and comments to ensure the plan update addresses the needs of the region.

Early Draft Chapters

- Lower West Coast Chapter 1: Introduction DRAFT
- Lower West Coast Chapter 3: Demand Management: Water Conservation – DRAFT
- Lower West Coast Chapter 4: Water Resource Protection DRAFT



Water Supply Plan Update Timeline



Jhank You

- Plan information can be found at <u>www.sfwmd.gov/lwcplan</u>
- Workshop announcements sent via email

Bob Verrastro, Plan Manager <u>bverras@sfwmd.gov</u> Tom Colios, Section Leader <u>tcolios@sfwmd.gov</u> Mark Elsner, Bureau Chief <u>melsner@sfwmd.gov</u>

Questions?