



**Sustainable
Water Resources**
Complex Challenges, Integrated Solutions



Regional Climate Projections – Future Rainfall Estimates for Florida

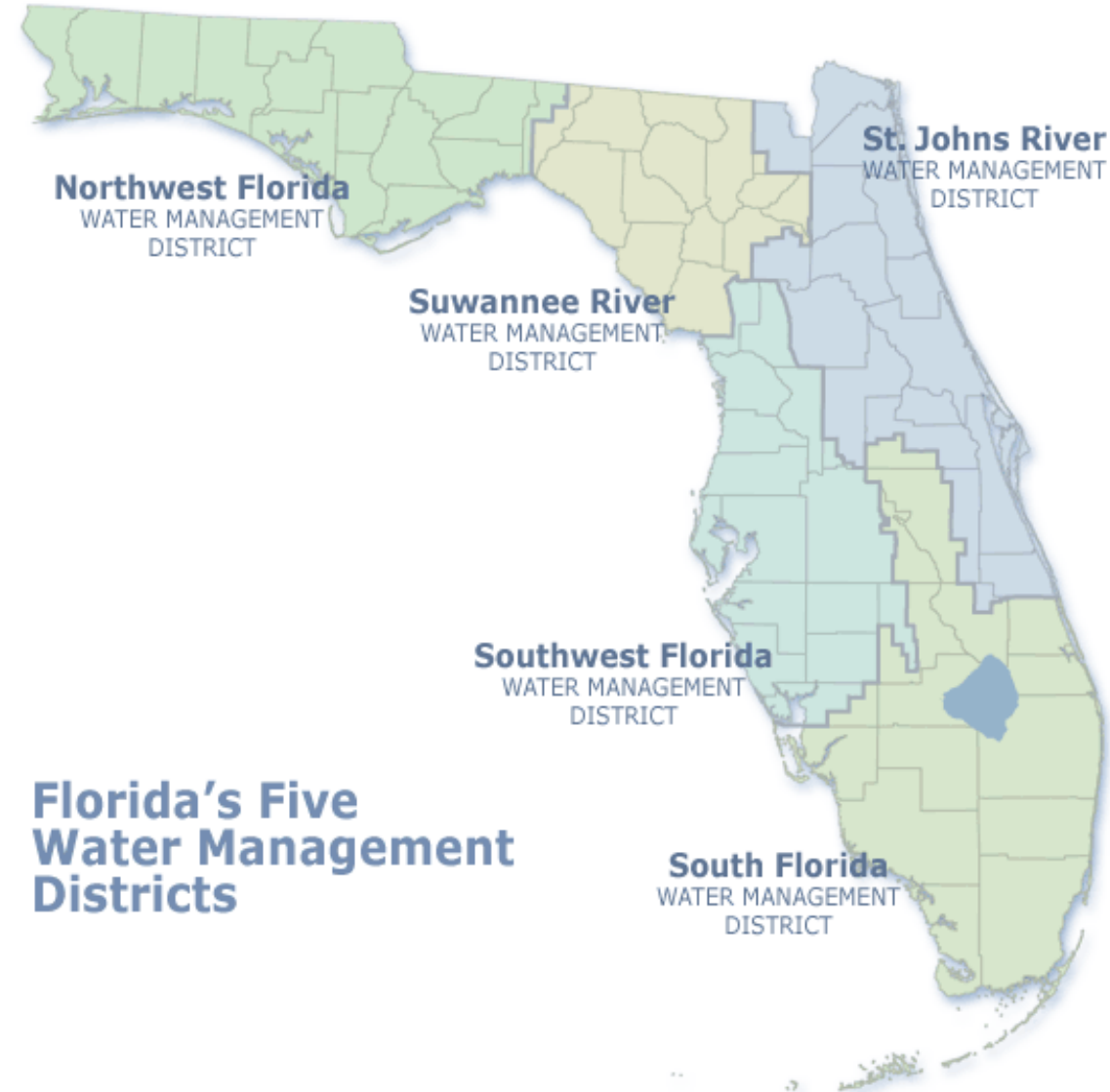
Carolina Maran, P.E., Ph.D., District Resiliency Officer

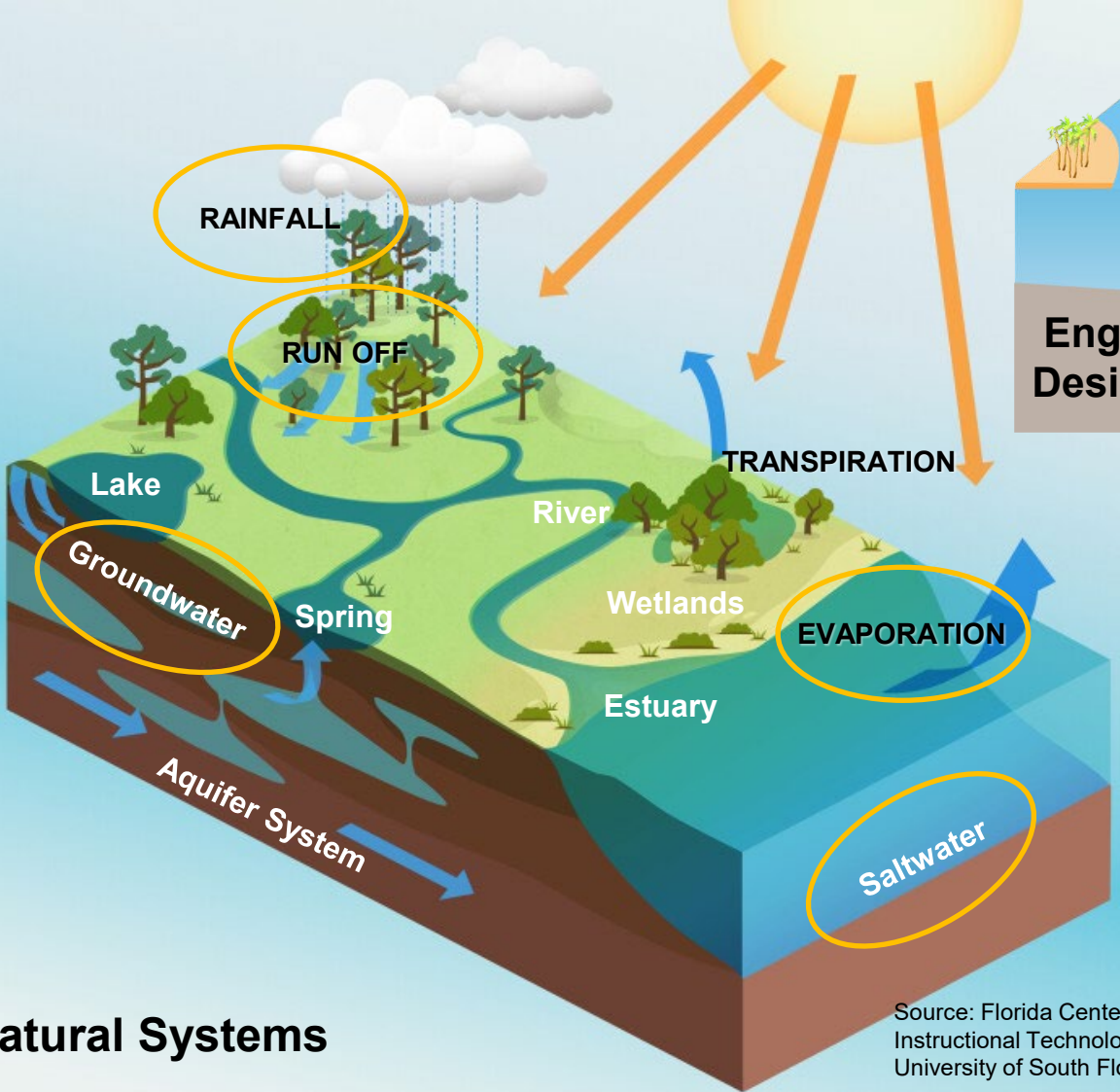
February 23, 2022

South Florida Water Management District

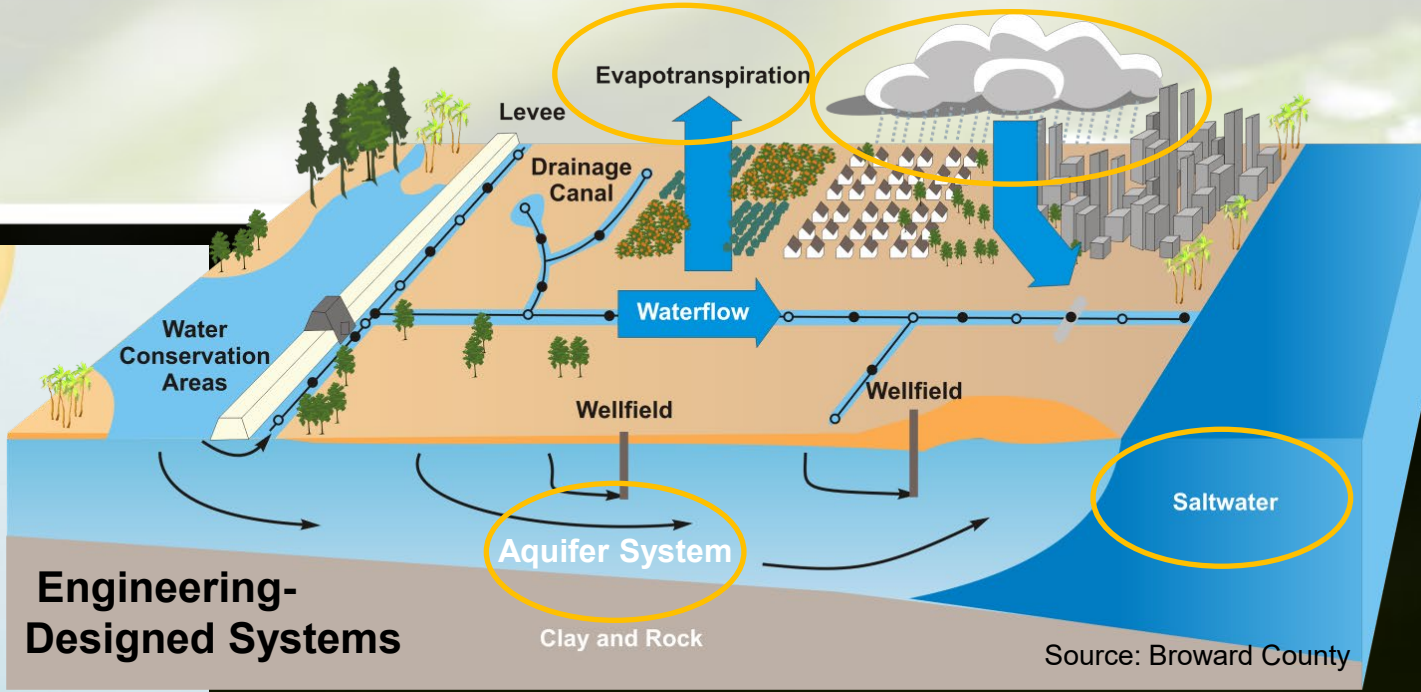
- Created in 1949, oldest and largest of the state's five water management districts
- 16 counties from Orlando to the Florida Keys
- Serves a population of 9 million residents
- 2,200 miles of canals; 2,100 miles of levees/berms, 84 pump stations, 778 water control structures and weirs and 621 project culverts

MISSION: to safeguard and restore South Florida's water resources and ecosystems, protect our communities from flooding, and meet the region's water needs while connecting with the public and stakeholders.





Natural Systems



Engineering-Designed Systems

OUR WATER MANAGEMENT SYSTEM & CHANGING HYDROLOGIC CONDITIONS

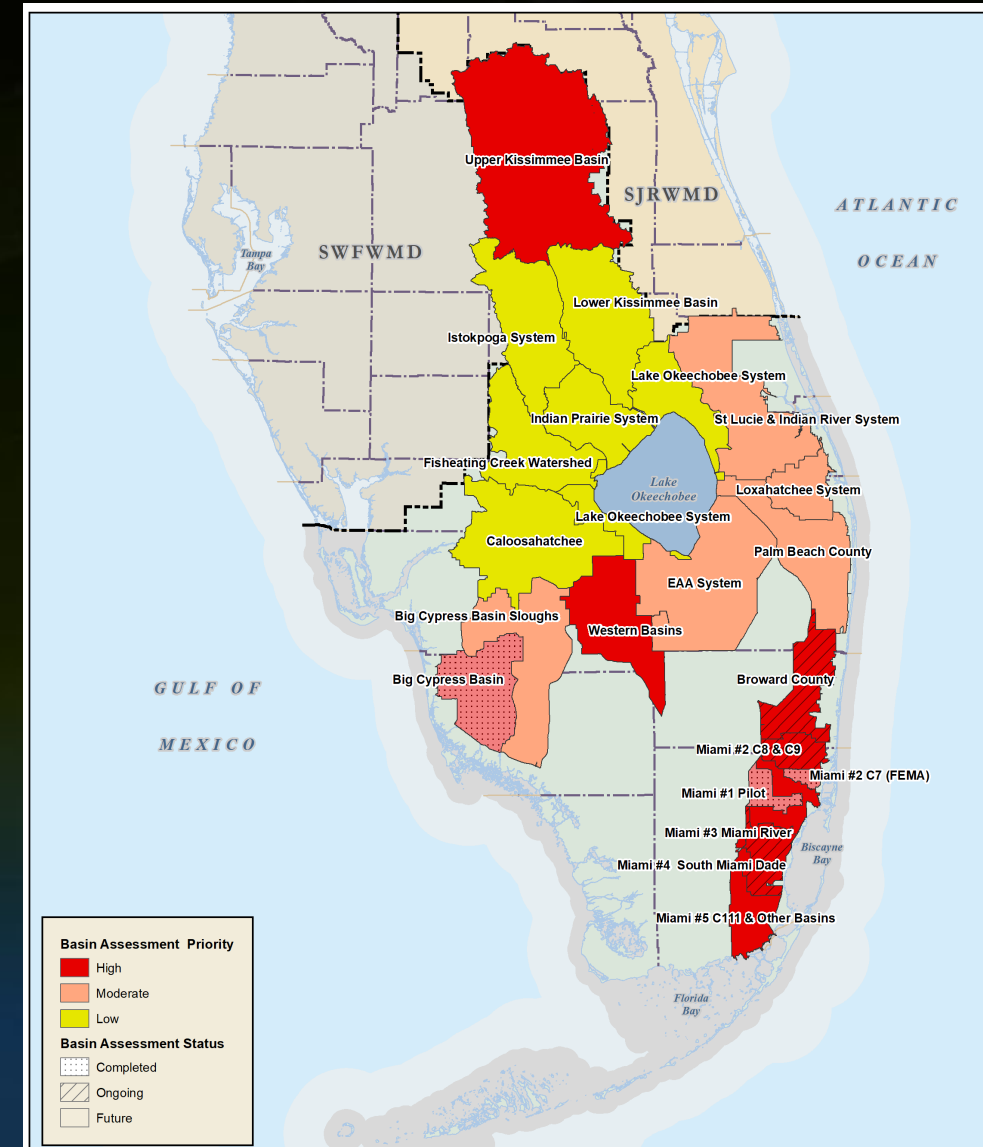
Flood Protection Level of Service Program

From Data Analysis to Robust H&H Modeling Assessments

Critical District's strategy to assess vulnerability and identify adaptation strategies to address land development and climate change impacts 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



PLAN: May 2019 Workshop FIU/SFWMD

Shorter-term strategy: rainfall estimates based on available global climate model downscaled datasets

Longer-term strategy: development of a Florida Regional Climate Model to capture particular conditions /mechanisms of rainfall occurrences in our State, including Tropical Storms and sea breeze contributions, among other important climatic processes.



Workshop Report and Strategy Document: Development of Unified Rainfall Scenarios for Florida

Sea Level Solutions Center, Institute of Water and Environment at Florida International University under contract from the South Florida Water Management District

FIU | Sea Level
Solutions Center
FLORIDA INTERNATIONAL UNIVERSITY



Review of Past and Recent Attempts (shorter-term strategy)

➤ Statistical Downscaling

- Bias-Corrected, Spatially Downscaled (USBR-BCSD)
- Bias-Corrected, Constructed Analogs (USBR-BCCA)
- Locally Constructed Analogs (LOCA)
- Multivariate Adaptive Constructed Analogs (MACA)
- Self Organizing Maps (SOM) (FIU, Penn State)
- Bias-Correction and Stochastic Analogs (UF)

SFWMD

SFWMD/Broward

SFWMD/Broward/FIU/USGS/FBC

USGS-FIU-SFWMD/FBC

SFWMD

USGS-FIU-SFWMD

➤ Dynamical Downscaling

- NARCCAP (from NCAR)
- Regional Spectral Model (RSM) (FSU)
- NA-CORDEX

Broward

Broward/USGS-FIU-SFWMD/FBC

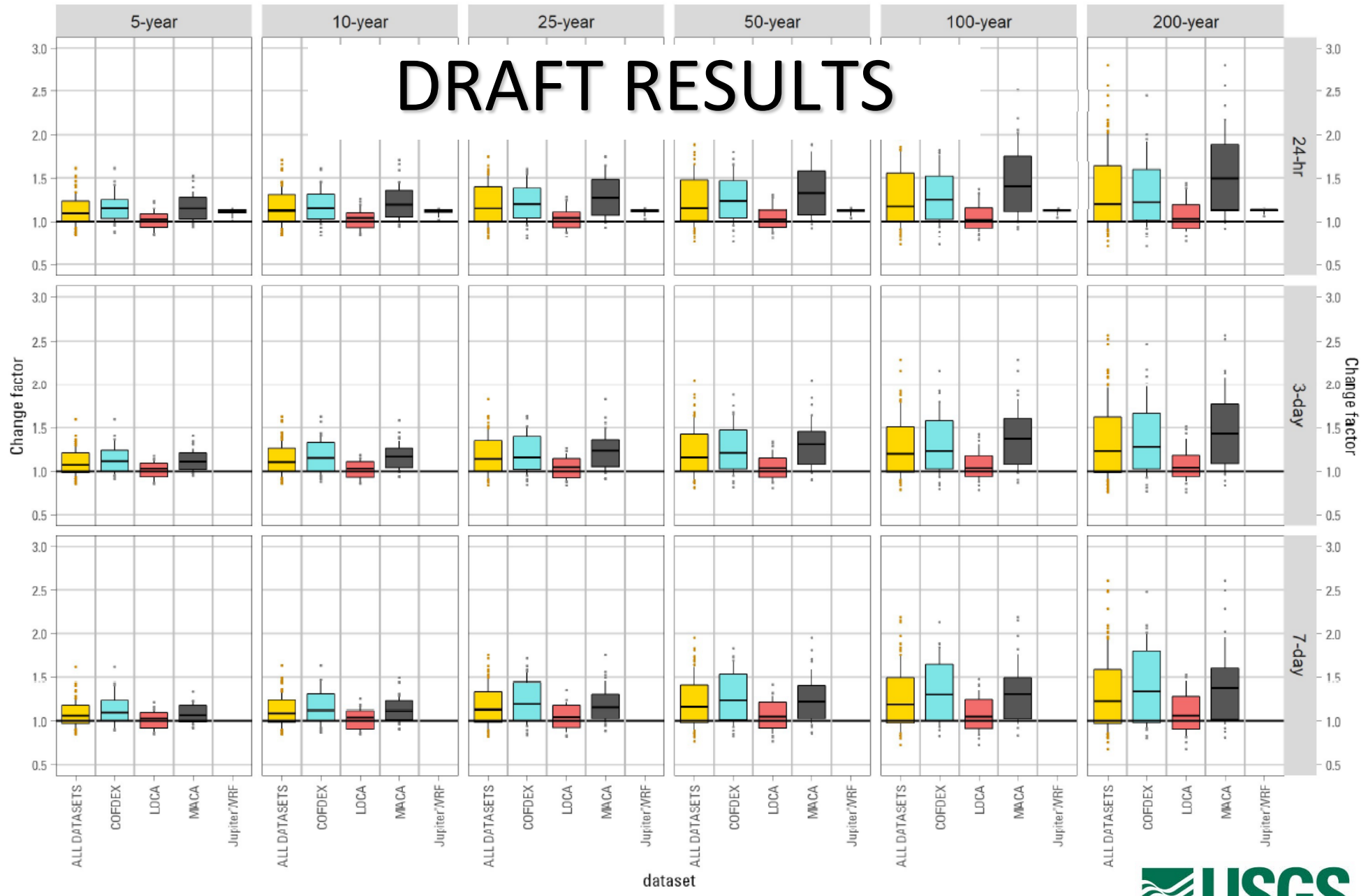
➤ Hybrid (Analog) Downscaling - Jupiter Int. WRF

Broward/USGS-FIU-SFWMD

➤ Raw GCMs

Broward

DRAFT RESULTS



Median Station Change Factors Across models in Climate Region 5 (South Florida, all models, all RCPs)

Box includes 16-60-84th percentile, whiskers are from 5-95th percentile. Points show outliers (values beyond 5th and 95th percentiles)

Preliminary Information-Subject to Revision. Not for Citation or Distribution

dataset ALL DATASETS (m=215) COFDEX (m=588) LOCA (m=60) MACA (m=80) Jupiter WRF (m=7)

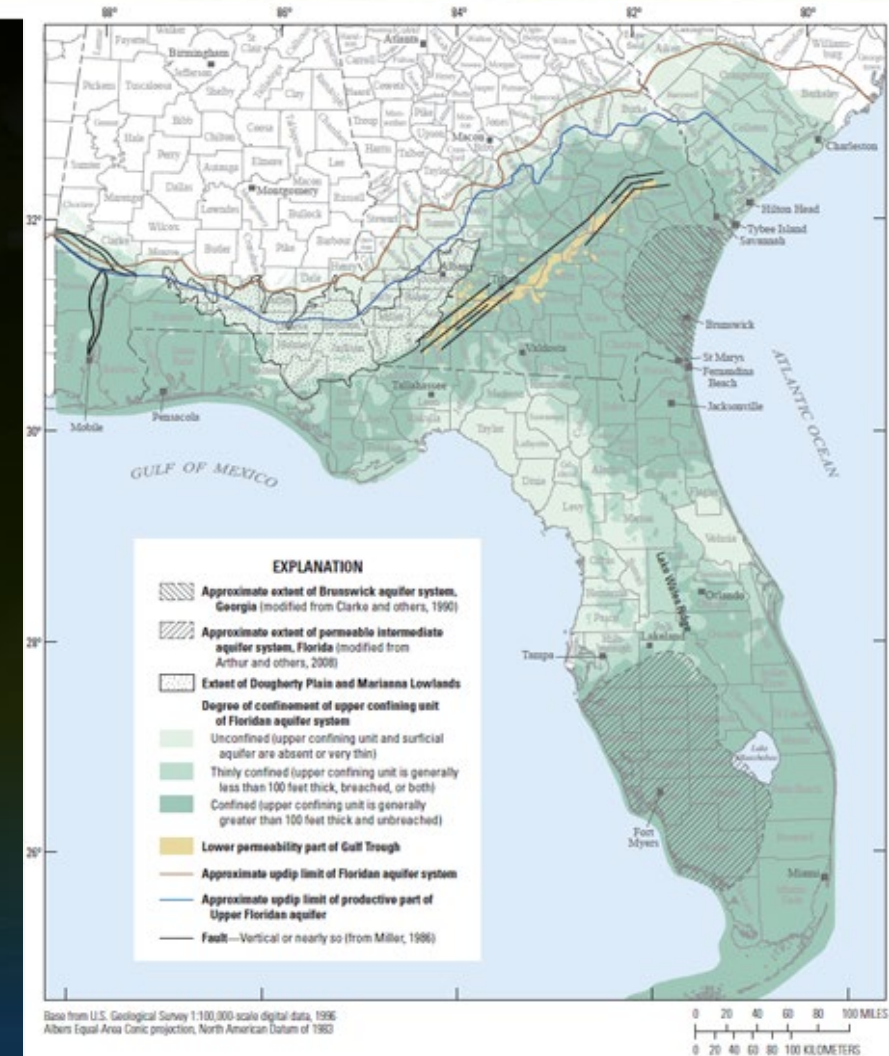
Next Steps: Statewide Regional Climate Projections

Regional climate model data for historical and projected climate using 10-km regional coupled ocean-atmosphere model and 2-km Weather Research and Forecasting Model, derived from state-of-the-art climate models centered over Florida and its watersheds/aquifers, that can reproduce rainfall drivers in Florida and more accurately represent future rainfall totals, seasonal, average, extreme dry and extreme wet.

- Support for Section 380.093 F.S. Resilient Florida's Statewide Flood Vulnerability Assessment
- Accessible statewide regional climate projections web portal and local governments engagement
- Scientist-Stakeholder Workgroup Recommendations Report
- Future rainfall depth duration frequency curves and other estimated data summaries

Statewide Regional Climate Projections

- Simulate “historical” (modern) and “projected” (future) climate and associated uncertainties
- Include hydrologic variables (e.g., temperature, evapotranspiration, rainfall and other external drivers)
- Stakeholder-scientist working group: selection of regional climate model(s) and their resolution, atmosphere-ocean general circulation models to downscale, periods, emission scenarios and events of interest
- Both coarse-resolution and high-resolution models
- Evaluation of wet and dry years and extreme events (e.g. hurricanes) simulated by regional climate models
- Multi-decadal simulations of historical and projected climate scenarios based on downscaling of high-resolution models



Relative degree of confinement of the upper confining unit of the Floridan aquifer system, from [Williams and Kuniansky \(2015\)](#)

Statewide Regional Climate Projections

Project Highlights:

- develop a high-resolution coupled ocean-atmosphere model
- produce comprehensive analysis of extremes and estimates of climate projection with reduced uncertainty
- involve stakeholders, so outcomes are actionable and fully utilized
- support effective, adaptive, and resilient operational, infrastructural decisions
- allow for informed planning for adaptation/mitigation measures at local and regional levels, integrated to coastal risk strategies (sea level rise driven)



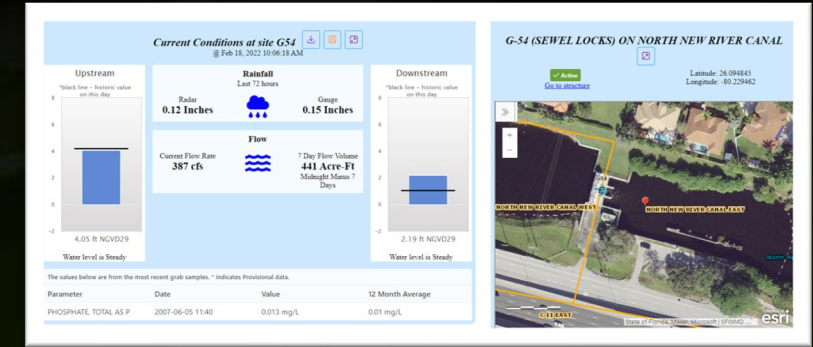
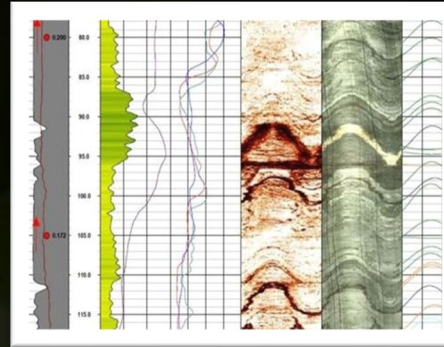
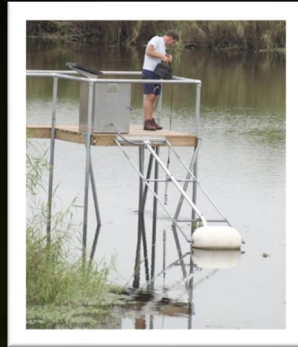
Our Future: Resiliency Issues on the Horizon

- There is a problem and there are opportunities
- Take advantage of available data, technology and innovation
- It will take time and money to solve
- Collaboration is key: solutions span multiple boundaries



Photo by Paul Krashefski

Data: DBHYDRO Insights



DBHYDRO is SFWMD's database that stores hydrologic, meteorologic, hydrogeologic, and water quality data. This database is the source of historical and up-to-date data for the 16-county region covered by the District.

The DBHYDRO allows the user to search and to generate a summary of data from the available period of record, select data sets of interest, and have the time series data dynamically displayed in tables or graphs. Users can also download data for later use.

In 2021, SFWMD released a new tool called **DBHYDRO Insights** to make data more easily accessible to the public and stakeholders. New features to access data are under development and the District welcomes feedback and ideas on how to improve the user experience.

To access the database, DBHYDRO Browser training videos, and contacts page visit

<https://www.sfwmd.gov/dbhydro> <https://apps.sfwmd.gov/dbhydroInsights/>

If you wish to provide feedback on features, please contact

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Brian Turcotte, Enterprise Scientific Data Mgr., bturcott@sfwmd.gov



Subscribe for District Resiliency Updates

Sign-up for our updates by visiting <https://www.sfwmd.gov/news-events> and following these simple steps:

- 1 - Click on the “Subscribe for Email” icon
- 2 - Enter your email address
- 3 - Select “District Resiliency” under Subscription Topics

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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News and Meetings

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

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

Public Notices

- Governing Board Meeting Notices

3

- You may sign-in to update your current preferences if you're already signed-up.

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District Resiliency Officer

South Florida Water Management District

www.sfwmd.gov/resiliency



Thanks!
Discussions?