

Enhancing Regional Resilience Through Flood Occurrence Data Collection and Stakeholder Engagement

10th Biennial Water Institute Symposium
Gainesville, FL

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February 25, 2026

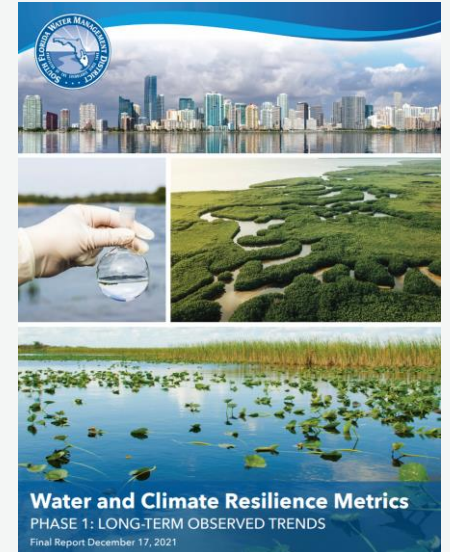


Water and Climate Resilience Metrics

[Water and Climate Resilience Metrics | South Florida Water Management District](#)

Goals and Objectives:

- Track and document **trends and shifts in water and climate data** monitored by the District.
- Support long-term term planning by incorporating observed trends into **future scenario formulation**.
- Advance the District's resiliency goals by **informing infrastructure investments and operational decisions** of ensuring flood protection, water supply, and ecosystem restoration mission elements under current and future climate conditions.



Phase I

Initiated in 2020, focused on implementing an initial set of priority metrics and automating trend analyses of metrics data stored DBHYDRO.

Phase II

Initiated in 2025, focuses on refining and expanding the assessment of changing water and climate conditions.

Water and Climate Resilience Metrics

➤ Climate Metrics

Indicators that reflect the primary drivers of observed changes in climate conditions and influence the hydrological cycle.

➤ Resilience Metrics

Indicators that represent the observed effects of changing climate conditions. These may be managed or mitigated through water management operations and/or by implementing adaptation strategies.

Phase	Metric	Category	Trend Analysis	Automation
I	Rainfall	Climate	✓ ¹	✗
I	Evapotranspiration (ET)	Climate	✓	✓
I	Tidal Elevations at Coastal Structures	Climate	✓	✓
I	High Tide Events (Limited Flood Control Capacity Events)	Climate	✓ ²	✗
I	Groundwater Levels/Elevations/Stages	Resilience	✓	✓
I	Saltwater Intrusion/ Saltwater Interface – Chloride Levels	Resilience	✓ ¹	✓
I	Minimum Flows and Minimum Water Levels (MFLs) – Exceedances/ Violations	Resilience	✓	✓
I	Flooding Events	Resilience	✓	✗
I	Water Temperature	Resilience	✓	✓
I	Dissolved Oxygen (DO)	Resilience	✓	✓
I	pH	Resilience	✓	✓
I	Specific Conductance	Resilience	✓	✓
I	Estuarine Inland Migration – Everglades	Resilience	✓	✗
I	Soil Subsidence	Resilience	✓	✗
I	Salinity in the Everglades and Biscayne Bay	Resilience	✓	✗
II	Drought	Climate	✓ ²	✗
II	Freshwater Lens	Resilience	⊠	⊠
II	Stormwater Volume and Flow	Resilience	⊠	⊠
II	Algal Blooms	Resilience	⊠	⊠
II	Atlantic Multidecadal Variability (AMV)	Climate	⊠	⊠

✓ Trend analysis and/or tool automation were completed for the metric.

✗ Trend analysis and/or automation were not completed for the metric.

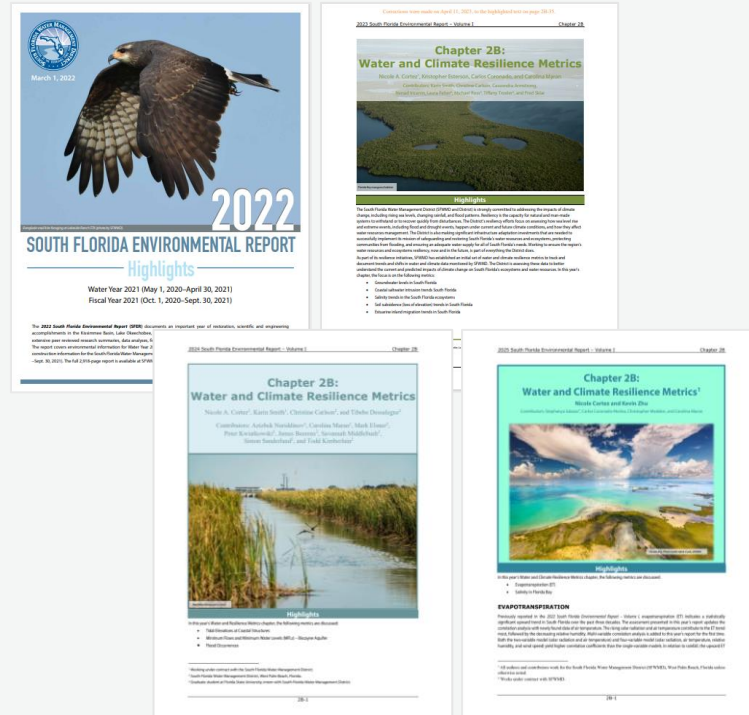
⊠ Trend analysis and/or automation are pending development for the metric.

¹Updated analysis pending publication March 1, 2026.

²First analysis pending publication March 1, 2026.

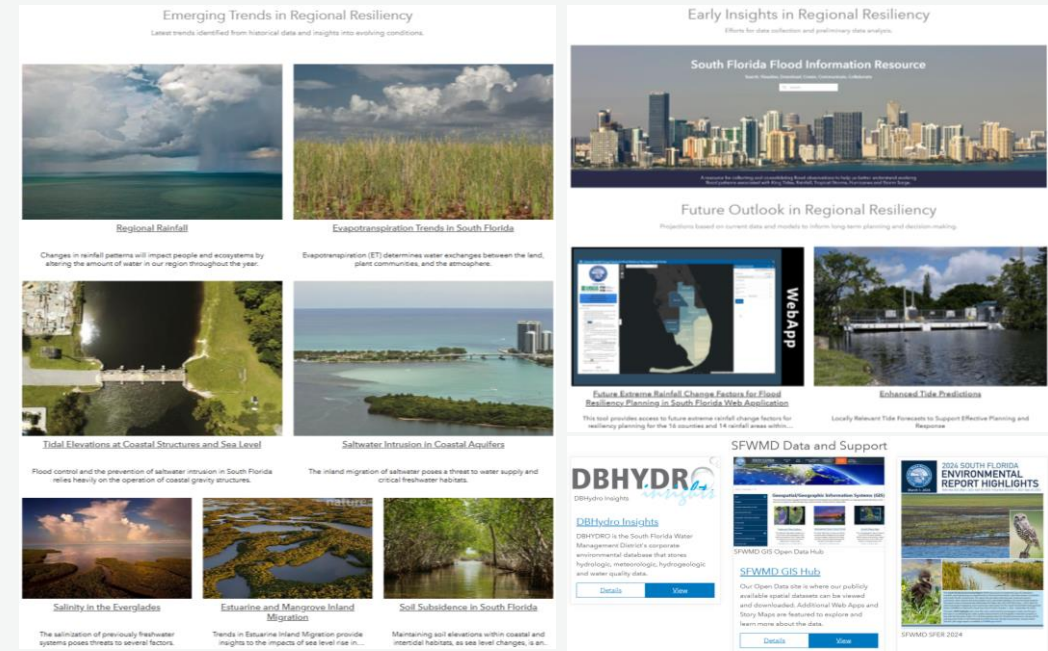
Water and Climate Resilience Metrics

Technical Reports



sfwmd.gov/SFER

Online Resources



sfwmd.gov/ResilienceMetricsHub



Why Observed Flood Data?

Flood Drivers

System response linked to weather and climate, hydrologic connectivity, infrastructure and water management operations.

- **Primary Physical**
 - Low-lying topography
 - High water table & karst geology
 - Hydrologic connectivity (SW–GW–coastal)
- **Climatic & Oceanic drivers**
 - Extreme rainfall / tropical systems
 - Storm surge
 - High tides / king tides
- **Anthropogenic Drivers**
 - Urbanization & imperviousness
 - Drainage & flood control infrastructure and operations
 - Design exceedance conditions

Models vs Observations

- Relate to pluvial, fluvial, and coastal events
- Support model validation
- Set up standardized data collection, archiving, and analytical architecture



Resiliency Planning Needs for Water Resources Management

- **Analyze long-term flood trends**
(frequency, duration, intensity, spatial extent, flood-prone areas)
- **Support hydrologic & hydraulic (H&H) model validation**
(compare modeled vs. observed conditions)
- **Document flood damage impacts**
(support planning, funding justifications, and grant applications)



Current Flood Data Landscape

Who's collecting data?

Number of Identified Flood Data Collection Tools by Governance Level

Governance Level	Count/Sub-Total
Municipal	8
County	22
Regional	2
Federal	1
NGO	2
Total:	35

What's the purpose and application?

Flood Data Collection Tools Purpose and Application

Category	Purpose	Applicability
Flood Observation Tools	Designed to document flood conditions (e.g., location, depth, photos)	Best suited for spatial and temporal flood analysis, but representing a minority of operating tools
Complaint / Information / Service Request Systems	General-purpose platforms for report local issues	Prioritize issue resolution, as over data consistency and long-term analysis
Damage Reporting and Emergency Response Tools	Activated during emergency events and support response and recovery	Focus on impacts rather than flood processes, most limited temporal continuity

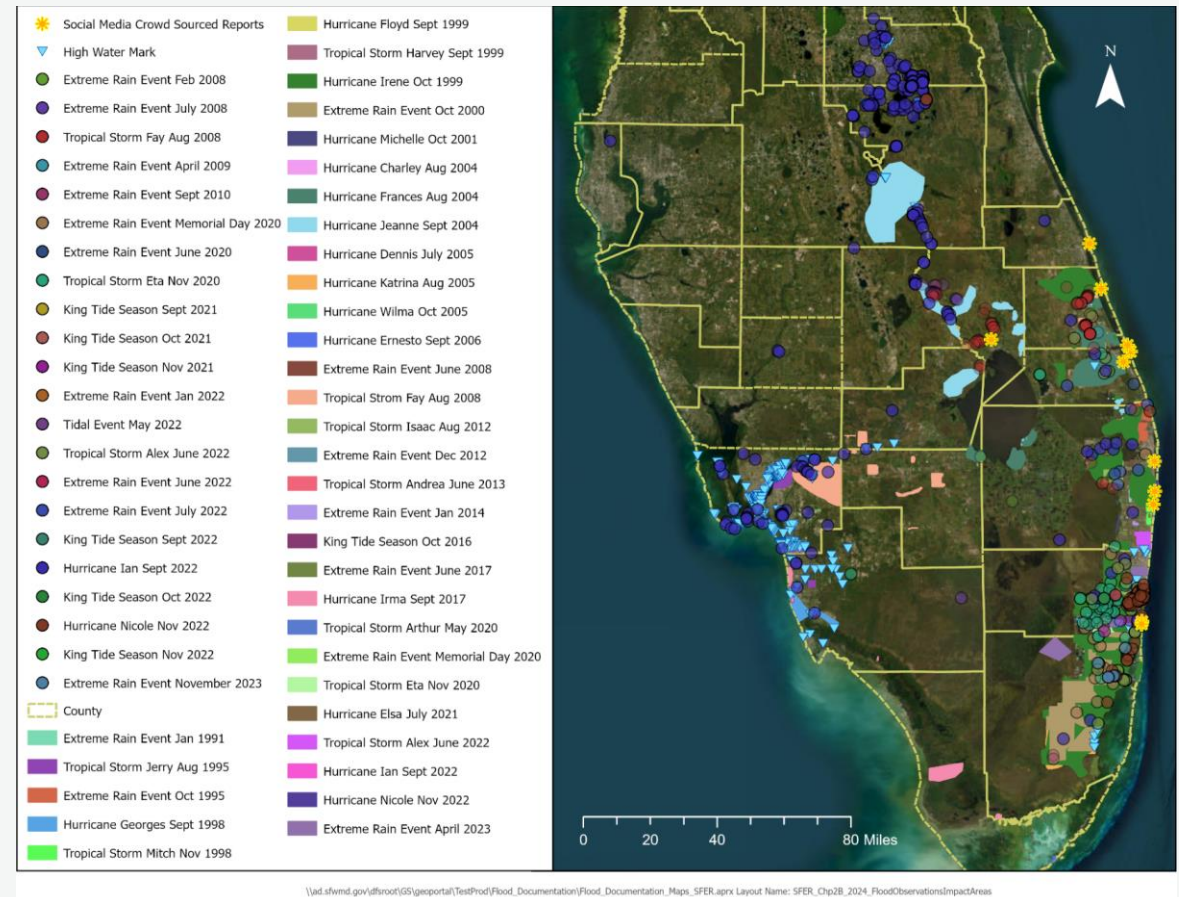
Early Approach & Findings (2023)

Data Discovery & Synthesis

- Internal archives + Public sources
- Historical event documentation
- 1991-2023

Outcomes

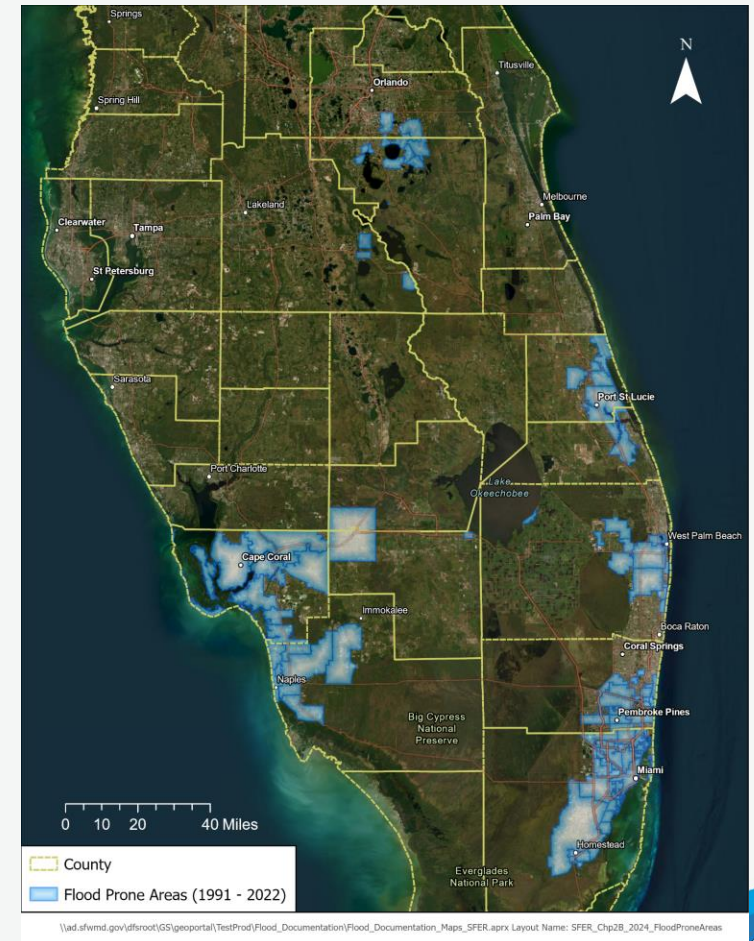
- Identification of historically impacted areas used to initial set of Flood Prone Areas



Early Approach & Findings (2023, continued)

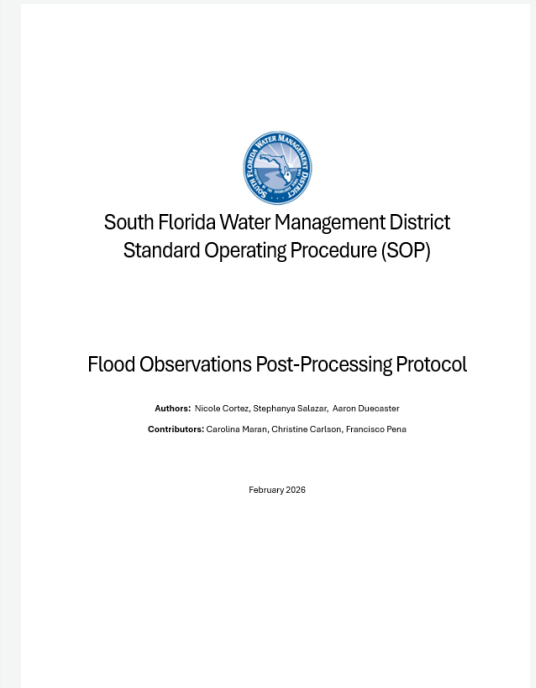
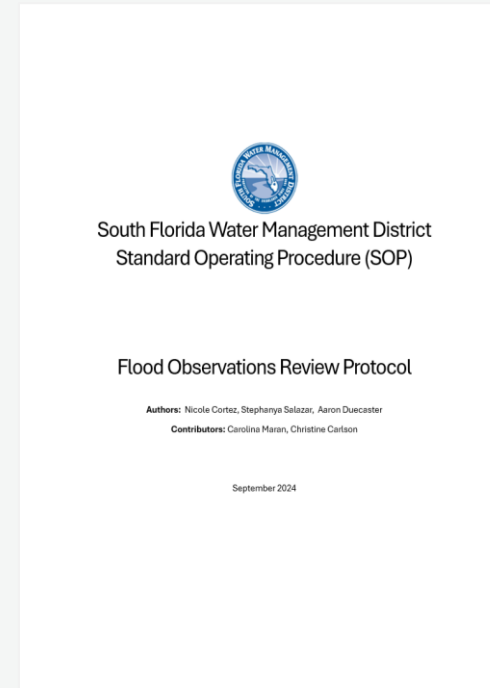
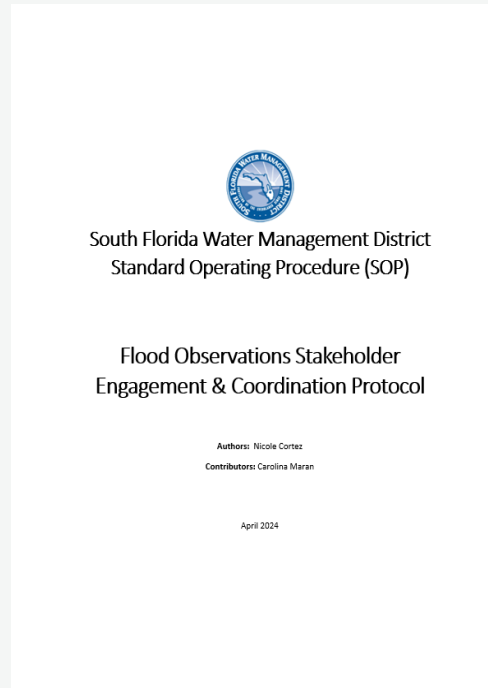
Outcomes

- Identified (initial set) flood-prone areas (by municipality and watershed)
- Assessed hydrologic data availability
- Informed monitoring gaps needs and infrastructure



Current Approach (2024-present)

GIS-based Data Infrastructure and End-to-end Workflow



Current Approach (2024-present, continued)

Year-Round Effort

- **January-February**
 - Post-processing
- **March**
 - Reporting
- **April**
 - Staff training
- **May-December**
 - Wet / Hurricane / King Tide Season

Stakeholder

Engagement/Coordination

Internal

- Field Staff
- External Affairs
- Operations
- IT/GIS

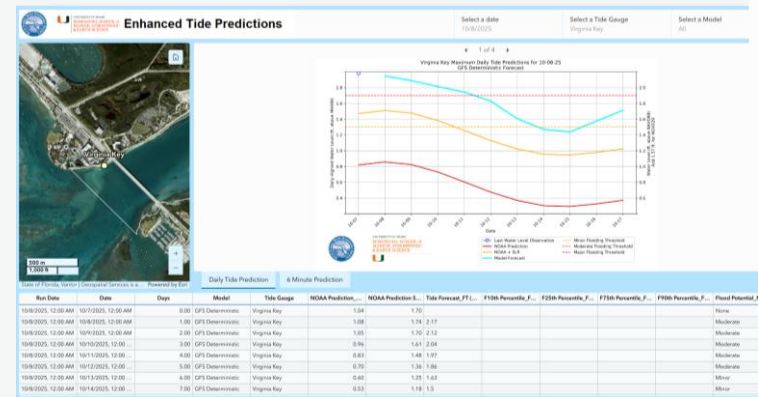
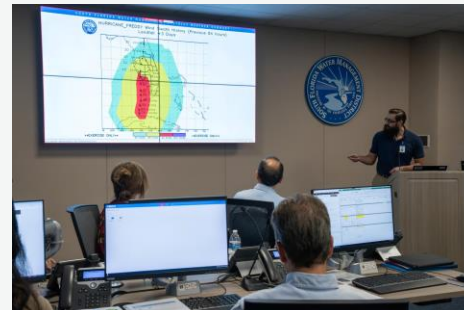
External

- Local Government Staff
- 298 District Staff

Current Approach (2024-present, continued)

Tools, Resources, and Communications

- Flood Information Resource (hub site)
- Flood Obs and HWM Survey (data collection)
- Flood Information Viewer (data repository)
- Annual Training (all tools)
- Weather Updates + Enhanced Tide Predictions
- Automated Notifications + Email Bulletins



South Florida Flood Information Resource

Search, Visualize, Download, Create, Communicate, Collaborate

A resource for collecting and consolidating flood observations to help us better understand evolving flood patterns associated with King Tides, Rainfall, Tropical Storms, Hurricanes and Storm Surge.

Local Contact Viewer

Who to Contact about Flooding in your area:

Use this application to enter an address or location and be returned contact information for local governments and 293 / Special Districts responsible for addressing flooding at this location.

Photos and Flood Observations:

Click or scan this QR code to upload photos or submit information about flooding and/or flooding concerns in your area.

To provide information and photos for past events, please contact bsallency@sfwmd.gov.

Scan the QR Code

South Florida Flood Information Resource Public Viewer:

To access: Click on the image to the left. This application is designed for exploration of publicly shared Flood Information Repository content. Data for this application was compiled from a variety of sources.



Data Collection



ArcGIS
Survey123

[SFWMD.gov/FloodingApp](https://sfwmd.gov/FloodingApp)

< 2025 Flood Observations and Early Concerns



Owner: sfwmdOutreach
Created: 3/7/25 9:26 AM
Modified: 1/7/26 1:01 PM

This template includes all XLSForm features supported in ArcGIS Survey123.

+ Collect >

Outbox 1 >

Sent 8 >

Report Flooding and Early Concerns



The information collected in this survey is used by agencies to better understand flooding conditions in Central and Southern Florida. This survey does not replace the need to contact your local drainage operator.

All flooding that poses a risk to your home or property should be reported to your local drainage operator. Life-threatening flooding should always be reported to 9-1-1.

To learn who to contact, go to [SFWMD.gov/FloodControl](https://sfwmd.gov/FloodControl) and enter your address.

Questions with a red * are required.

Reporting Category: *

☐ Flooding ☐ Flooding Concern

Date of Flooding:

Photos (1 required) *

Submit up to 3 photos.

✓

Report Flooding and Early Concerns

Photos (1 required) *

Submit up to 3 photos.

Flood Location *

Flood Depth:

☐ Less than ankle deep ☐ Ankle deep ☐ Knee deep ☐ Greater than knee deep ☐ Don't know / NA ☐ Other

Has this location flooded before?

☐ Never ☐ Whenever it rains ☐ Only during tropical events ☐ Sometimes ☐ Don't know / NA

Property Type:

☐ Agriculture ☐ Airport ☐ Commercial ☐ Governmental

✓

Report Flooding and Early Concerns

Property Type:

☐ Agriculture ☐ Airport ☐ Commercial ☐ Governmental ☐ Industrial ☐ Mixed Use ☐ Natural Area / Open Land / Recreational ☐ Residential

Affected Areas:

☐ Building / Structure ☐ Driveway / Garage ☐ Parking Lot ☐ Road / Street ☐ Seawall ☐ Storm Drain ☐ Swale ☐ Yard ☐ Field / Open / Natural Area ☐ Don't know ☐ Other

General Observations (Optional):

Name

Email

✓

Data Review



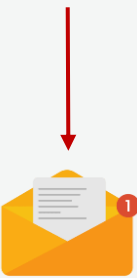
ArcGIS
Pro

Quality Assurance: attribute checks, spatial logic, governance controls

Observer Data

SFWMD Flood Observation ALL															SFWMD Flood Observat... PENDING REVIEW														
Field: Add Add Calculate Selection: Select By Attributes Zoom To Switch Clear Delete Copy																													
	Reporting Category:	Date of Flooding:	Flood Depth:	How Frequently Does Area Flood:	Property Type:	Affected Area:	General Observations:	Reviewer:	Water Year:	Flood Driver:	Event Name:	Review Comment:	Approved for Public Sharing:	Review Outcome...	Review Status:														
1	Flooding	11/6/2025 12:00:00 PM	ankle_deep	only_during_tropical_events	Mixed_Use	road_street	Flooded roadways present a challenge for restaurant...	ncortez	2026	Tide	2025 Tides	Photos show street flooding and elevated tidal elev...	Yes	Pass	Complete														
2	Flooding	10/27/2025 4:00:00 PM	knee_deep	sometimes	Commercial	road_street	2.5 lanes of southbound travel	ssalazar	2026	Rainfall	2025 Rainfall	<Null>	Yes	Pass	Complete														
3	Flooding	10/12/2025 4:00:00 PM	knee_deep	don't_know	Commercial	seawall	Water is rising at nearby storm drains on the main road	ccarlso	2026	Tide	2025 Tides	<Null>	Yes	Pass	Complete														
4	Flooding	10/12/2025 4:00:00 PM	ankle_deep	don't_know	Mixed_Use	road_street	<Null>	ccarlso	2026	Tide	2025 Tides	<Null>	Yes	Pass	Complete														
5	Flooding	10/12/2025 12:00:00 PM	don't_know	don't_know	Natural_Area_O...	field_open_area_natural_area	Observation from Martin County presentation; Notes...	aduecast	2026	Tide	2025 Tides	<Null>	Yes	Pass	Complete														
6	Flooding	10/12/2025 12:00:00 PM	don't_know	don't_know	Mixed_Use	road_street	Observation from Martin County presentation; Notes...	aduecast	2026	Tide	2025 Tides	<Null>	Yes	Pass	Complete														
7	Flooding	10/12/2025 12:00:00 PM	don't_know	don't_know	Mixed_Use	road_street	Observation from Martin County presentation; Notes...	aduecast	2026	Tide	2025 Tides	<Null>	Yes	Pass	Complete														
8	Flooding	10/9/2025 11:00:00 PM	ankle_deep	sometimes	Residential	road_street	<Null>	ncortez	2026	Rainfall	2025 Rainfall	This was immediately after heavy rainfall in Jupiter	Yes	Pass	Complete														
9	Flooding	10/9/2025 4:00:00 PM	ankle_deep	don't_know	Commercial	parking_lot	<Null>	ncortez	2026	Rainfall	2025 Rainfall	This was immediately after heavy rainfall in Jupiter	Yes	Pass	Complete														
10	Flooding	10/8/2025 4:00:00 PM	ankle_deep	don't_know	Commercial	road_street	King tide	ssalazar	2026	Tide	2025 Tides	King Tide Monitoring	Yes	Pass	Complete														
11	Flooding	10/8/2025 4:00:00 PM	ankle_deep	don't_know	Mixed_Use	road_street	<Null>	ssalazar	2026	Tide	2025 Tides	King Tide Monitoring	Yes	Pass	Complete														
12	Flooding	10/8/2025 12:00:00 PM	don't_know	don't_know	Mixed_Use	road_street	Observation from Martin County presentation; Notes...	aduecast	2026	Tide	2025 Tides	Flood Threshold for S-48	Yes	Pass	Complete														
13	Flooding	9/19/2025 4:00:00 PM	ankle_deep	whenever_it_rains	Mixed_Use	road_street	Standing water flooding street + swale, greater than...	ssalazar	2026	Rainfall	2025 Rainfall	<Null>	Yes	Pass	Complete														
14	Flooding	9/13/2025 4:00:00 PM	other	sometimes	Residential	yard	<Null>	ssalazar	2026	Rainfall	2025 Rainfall	Report on improving conditions	Yes	Pass	Complete														

Reviewer Data



Flood Observation Report Submission Pending Review

gisappdev

To **Flood_Report_Reviewers**

Cc **Kirouac, David**

Retention Policy Delete Emails over 5 years old (5 yea Expires 11/19/2030)

11/20/2025

There are 6 new submissions for Flood Observation Reports pending review.

South Florida Water Management District
Standard Operating Procedure (SOP)

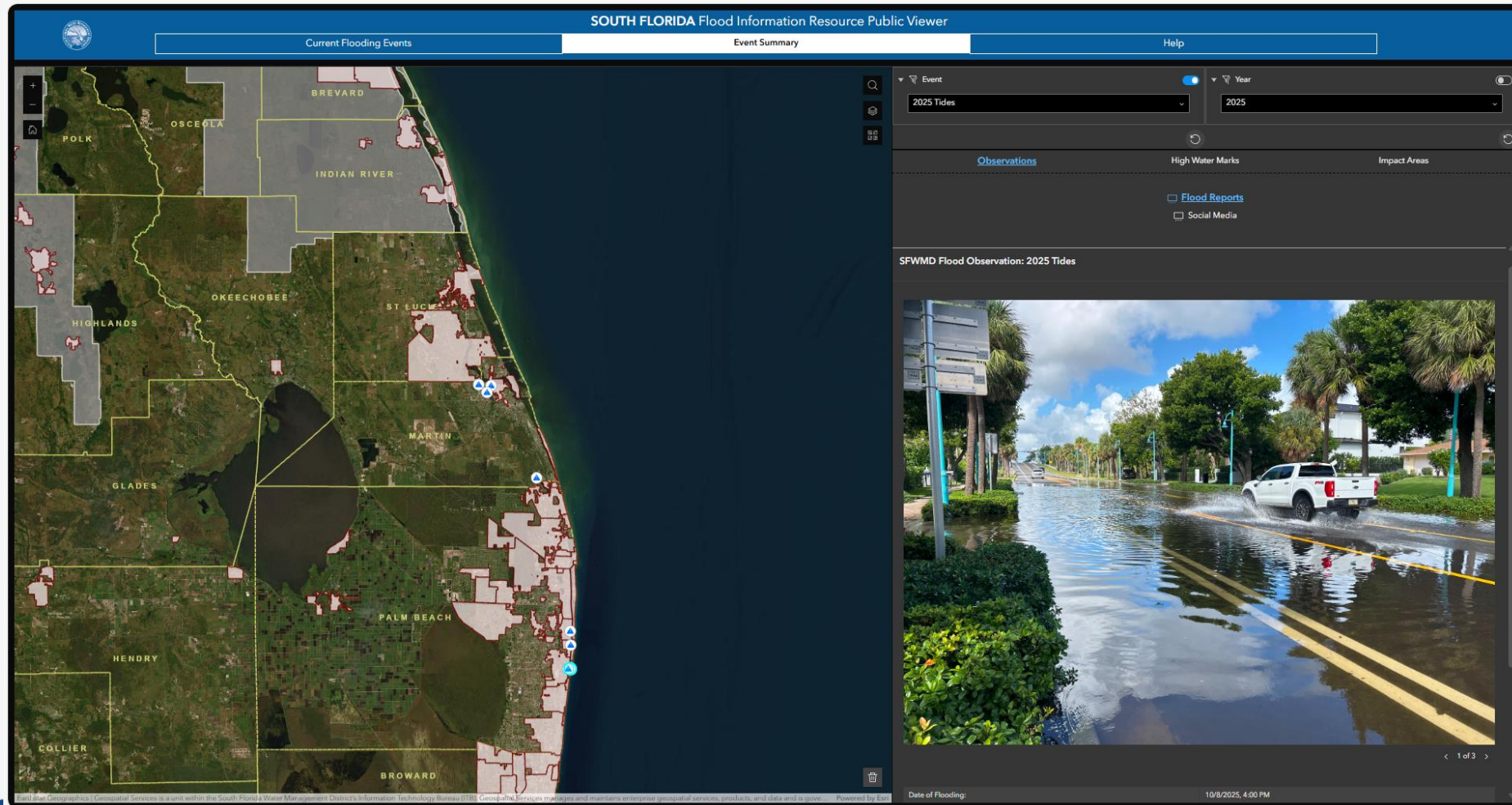
Flood Observations Review Protocol

Authors: Nicolas Cortez, Stephany Beltrán, Aaron Dancaster
Contributors: Caroline Pizarro, Christine Carlson

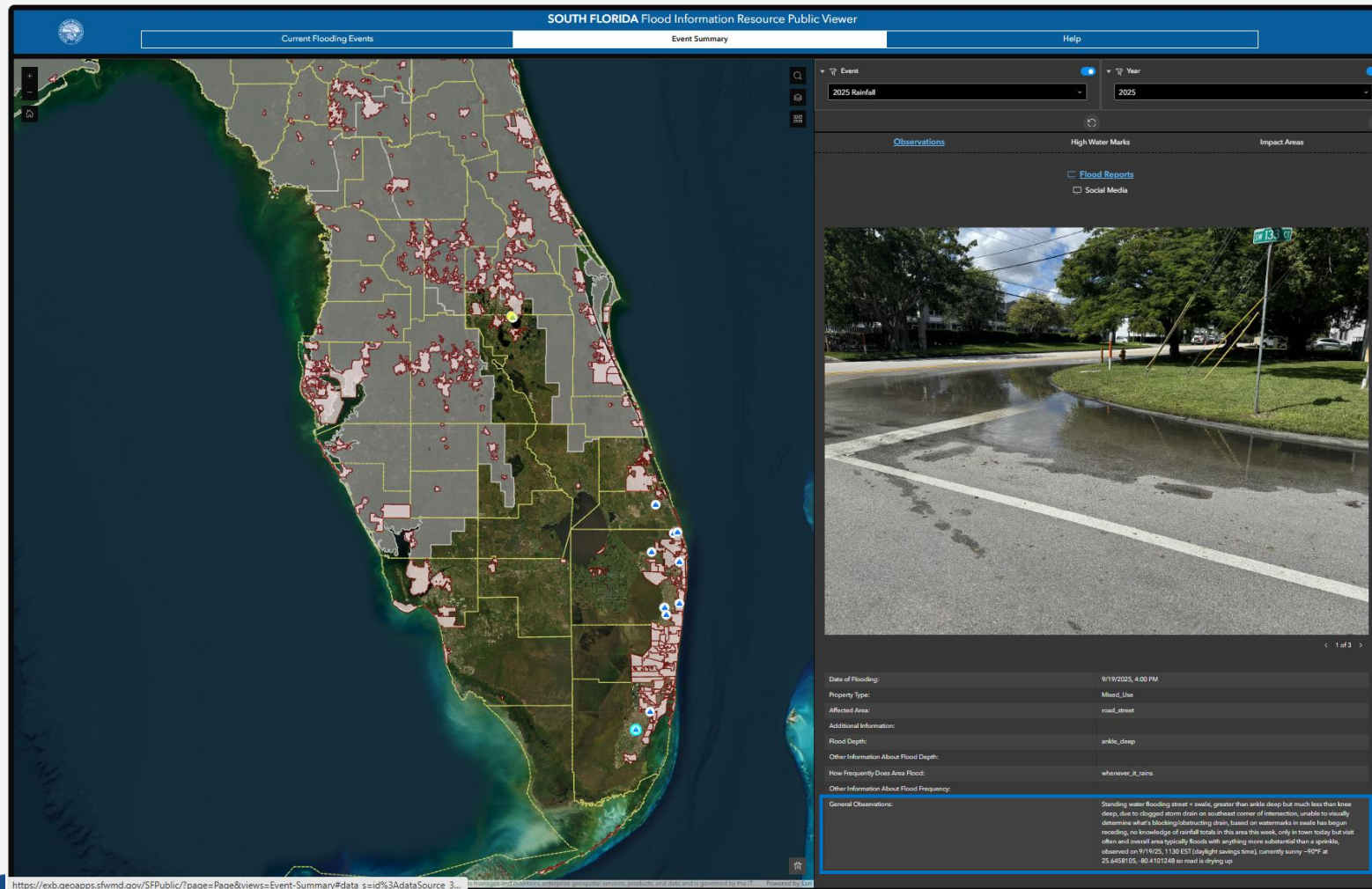
September 2024



Data Sharing (continued)



Data Sharing



Observer Comment:

Standing water flooding street + swale, greater than ankle deep but much less than knee deep, due to clogged storm drain on southeast corner of intersection, unable to visually determine what's blocking/obstructing drain, based on watermarks in swale has begun receding, no knowledge of rainfall totals in this area this week, only in town today but visit often and overall area typically floods with anything more substantial than a sprinkle, observed on 9/19/25, 1130 EST (daylight savings time), currently sunny ~90°F at 25.6458105, -80.4101248 so road is drying up

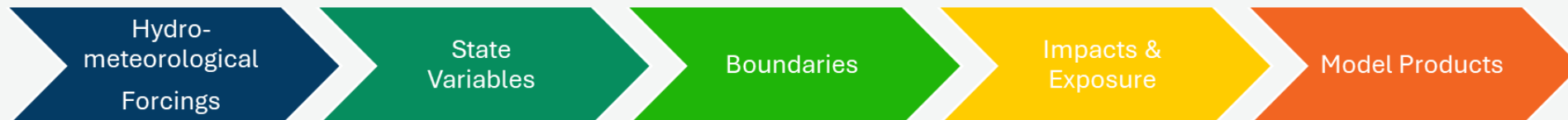
Post-processing

Two Parts

- Application of quality control process
- Integration of supplementary datasets

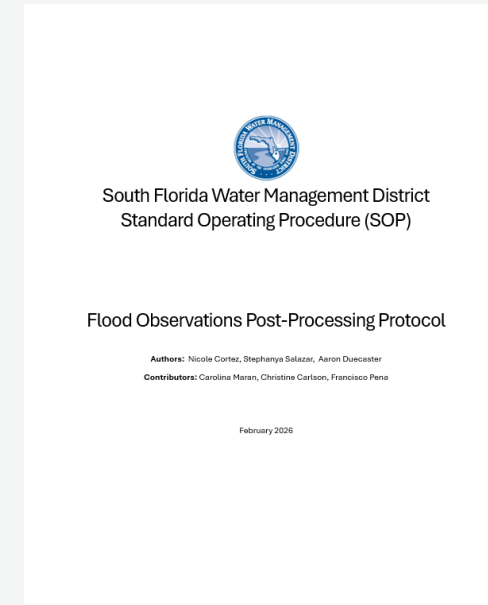
Supplementary Datasets

- Function-based framework



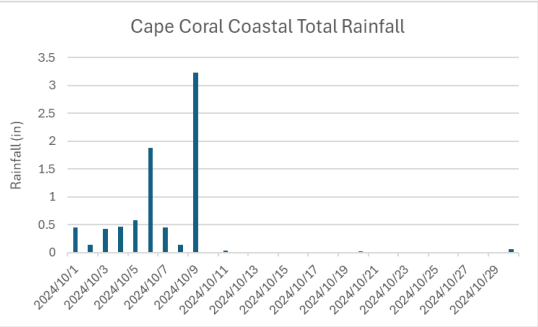
Result

- Support development of analysis/decision-ready work products that meet resiliency planning needs.

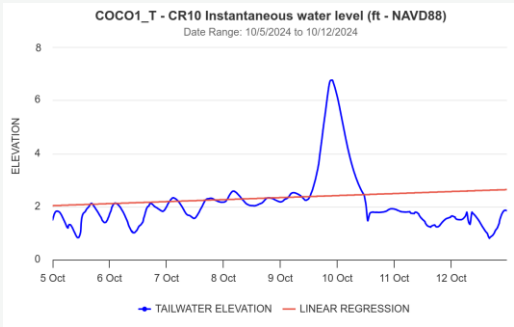


Example Supplementary Datasets

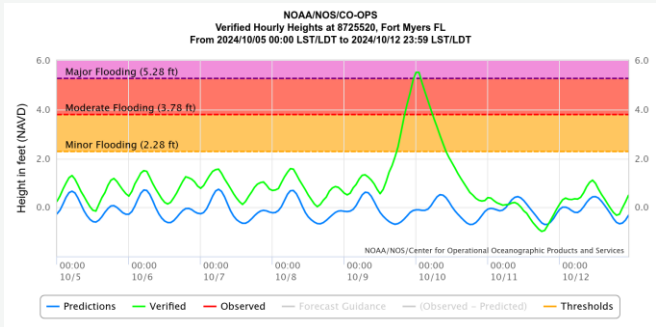
	Hydro-meteorological Forcings	State Variables	Boundaries	Impacts & Exposure	Model Products
Dataset	Rainfall	Canal stages	Tides	Synthetic Aperture Radar (SAR)	Model product
Source	NEXRAD	DBHYDRO	NOAA	ICEYE	Performance Metrics (PM) results
Temporal Type	Continuous / Near-real-time	Continuous	Continuous	Event-specific	SFWMD
Use	Event characterization	System condition	Coastal constraint	Exposure analysis	Retrospective



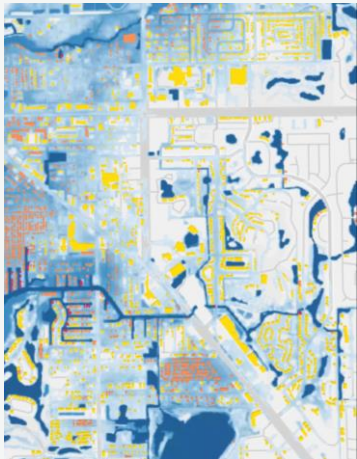
Nexrad Viewer



DBHYDROInsights Data



Water Levels –
NOAA Tides & Currents



SAR Technology -
ICEYE.com



PM 5: Stage based LOS
for sub-watersheds
sfwmd.gov/FPLoS



Work Products

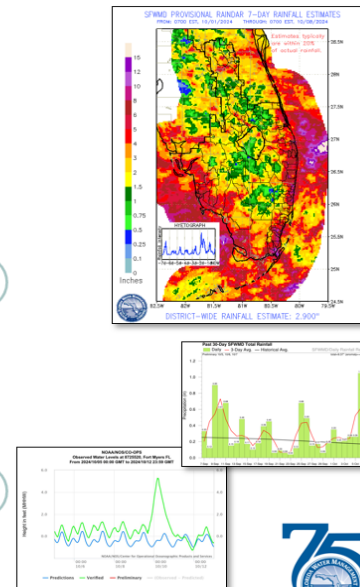
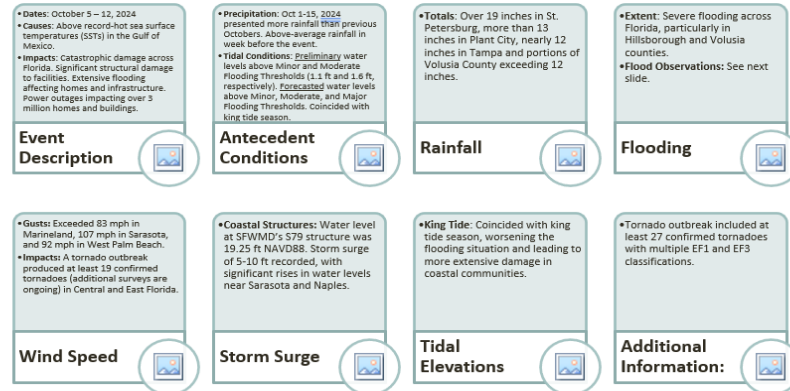
Resiliency Planning Goals → Ready-to-Use Products

Goal / Objective	Ready Product / Deliverables
Analyze long-term flood trends (frequency, duration, intensity, spatial extent, flood-prone areas)	• Event summaries for annual hydrology and WM reporting (SFER CH. 2A) • SAR-derived flood extent & depth for metrics reporting (SFER CH. 2B) • Data & map products for agency briefings and stakeholder coordination
Support hydrologic & hydraulic (H&H) model validation (compare modeled vs. observed conditions)	• Quality-controlled, GIS-ready datasets for model calibration and validation
Document flood damage impacts (support planning, funding, and grant applications)	• Quality-controlled, GIS-ready datasets • Geotagged photo repository • Summary products for grant and funding packages

Example Work Products

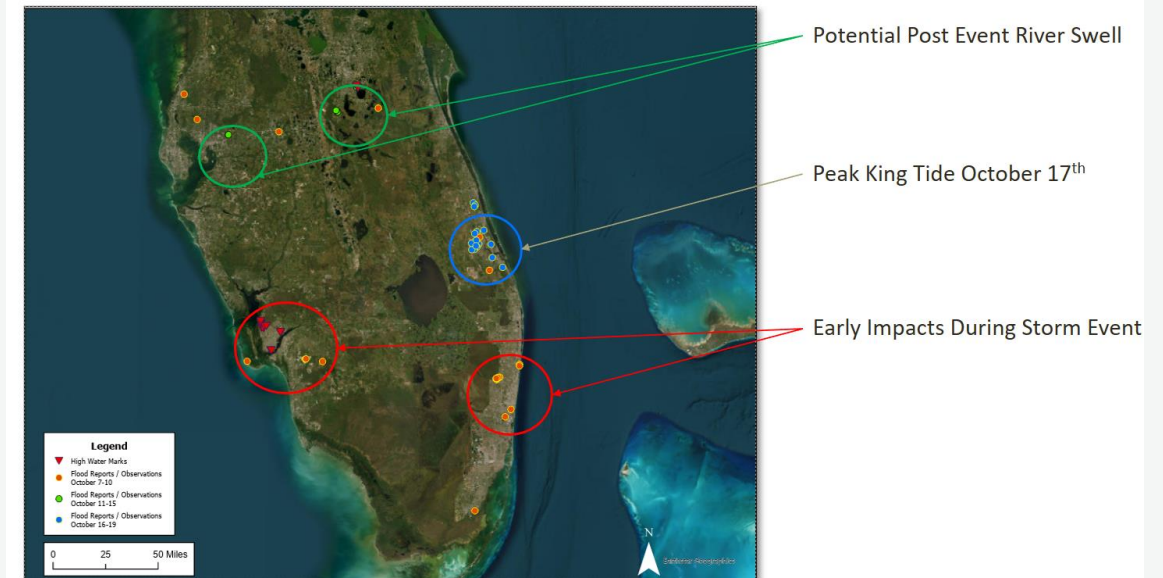
- Event summaries for annual hydrology and WM reporting (SFER CH. 2A)
- Data & map products for agency briefings and stakeholder coordination

Hurricane Milton, October 2024



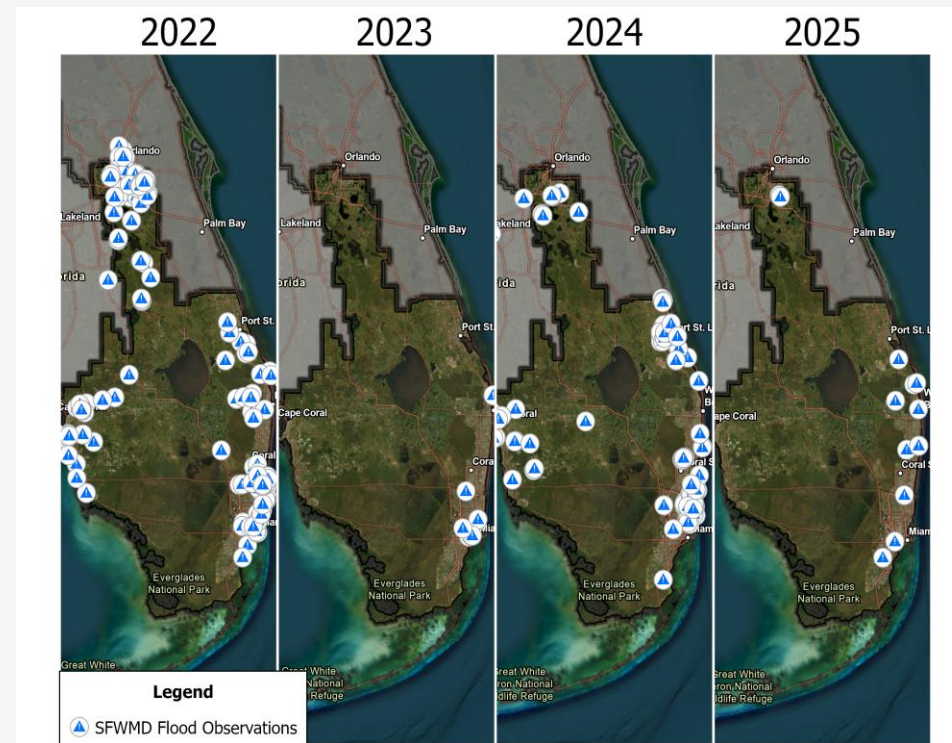
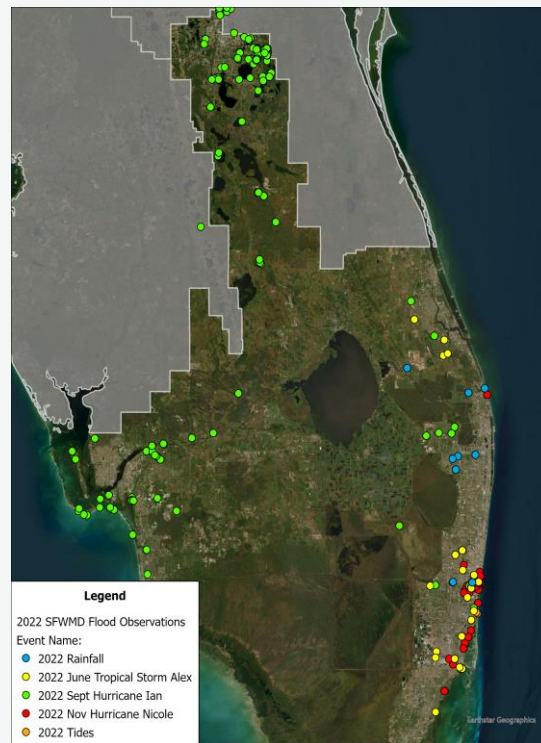
Information currently being compiled and summarized for the 2026 SFER Chapter 2A

Hurricane Milton, October 2024



Example Work Products (continued)

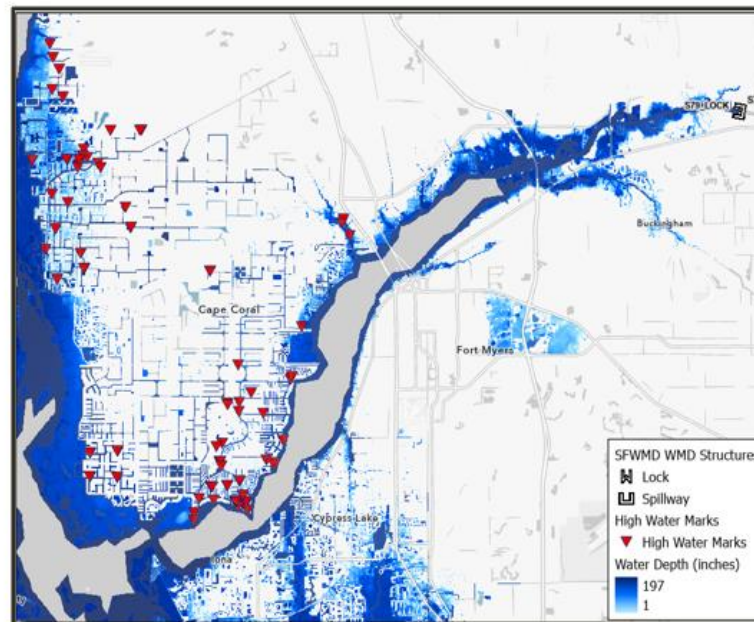
- Event summaries for annual hydrology and WM reporting (SFER CH. 2A)
- Data & map products for agency briefings and stakeholder coordination



Example Work Products (continued)

- Event summaries for annual hydrology and WM reporting (SFER CH. 2A)
- SAR-derived flood extent & depth for metrics reporting (SFER CH. 2B)
- Data & map products for agency briefings and stakeholder coordination

ICEYE Synthetic Aperture Radar (SAR)



Hx Milton Storm Surge Impacts (Downstream S-79)

Allows overall assessment of flood conditions – extent and depths

Subscription services position satellites to South Florida based on extreme event forecasts

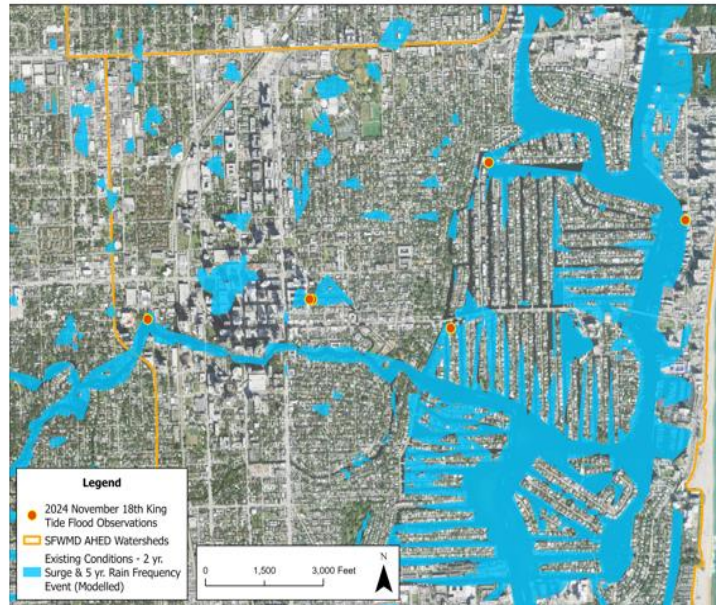
Real Time and post-processed data readily available throughout the storm



Example Work Products (continued)

- Quality-controlled, GIS-ready datasets for model calibration and validation

FPLOS Model Results Validation



2024 Wet Season

- Ft Lauderdale King Tide event, November 18, 2024
- Modeled Scenario: 2-year surge 5-year rainfall where depths are above 0.5' and over 8 hours duration.



Thank You!