

# Defining Flood Prone Areas and Estimating Flood Extent and Volume

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## Today's Presentation

- Sources and methods used to
  - Inventory historic flood event impact areas
  - Define flood prone areas
  - Compile flood extent and volume for Hurricane Ian
- Introduce the South Florida Flood Information Resource Hub
- Provide next steps for improving flood impact area information

# Sources and Methods Used to Inventory Historical Impact Areas

## ➤ Phase I

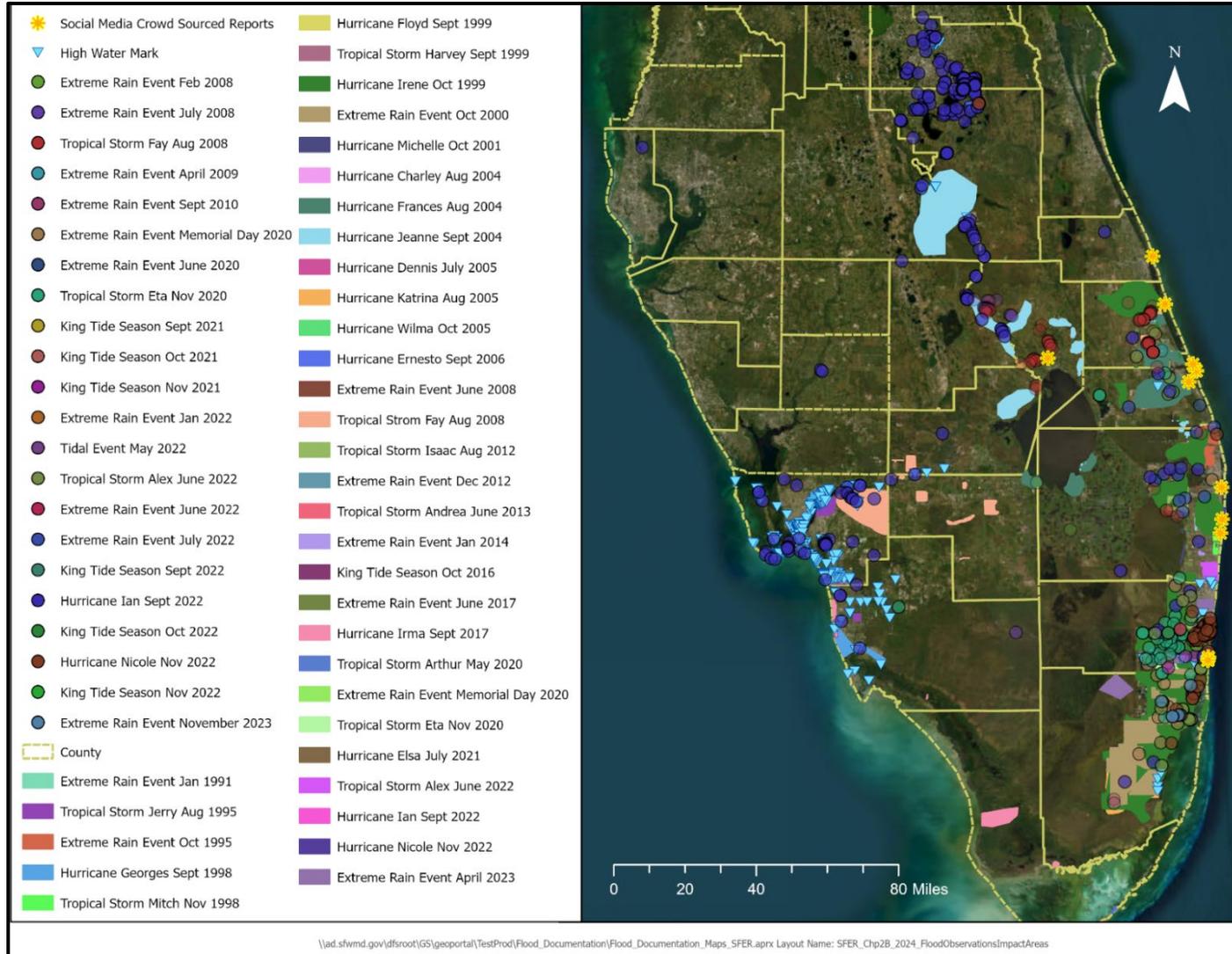
- Historic Citizen's Information Line Public reports by phone (decommissioned in 2017)\*
- Public reports by e-mail (2017 – 2023)\*
- Document the Flood Survey (deployed 2023 for agency and local government use)\*
- Environmental Conditions Team flood inundation and high-water mark documentation\*

## ➤ Phase II (Completed by our 2023 Summer Intern, Aziz Nuriddinov)

- *South Florida Hydrology and Water Management* chapters in Volume I of historical South Florida Environmental Reports (SFER)
- SFWMD's Internal Photo Database
- National Hurricane Center Tropical Cyclone Reports
- National Weather Service Event Index
- Social Media Reports\*
- Other web resources

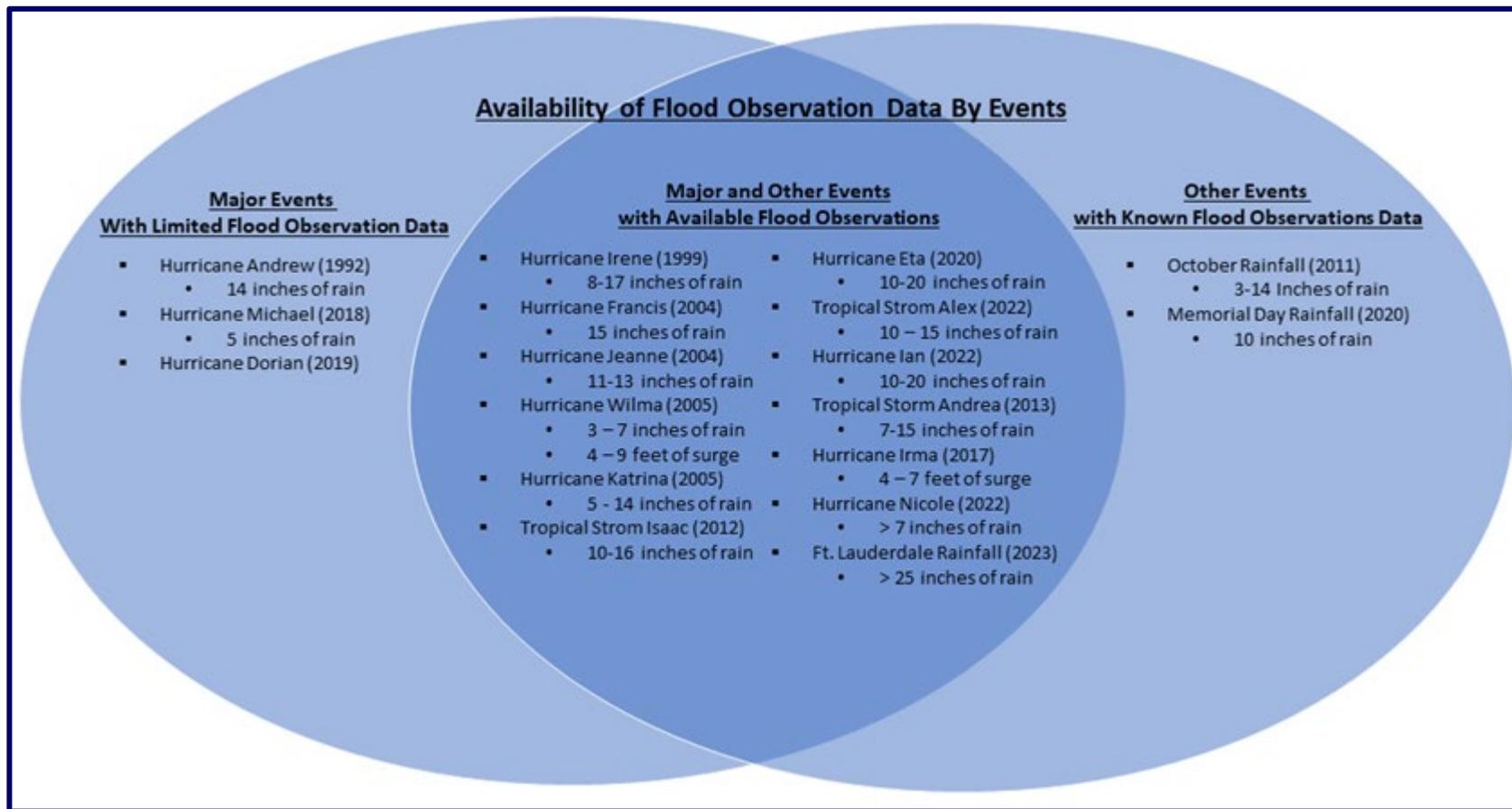
\* Sources historically or currently intended to inform real time operational decision making

# Historical Event Observation Locations

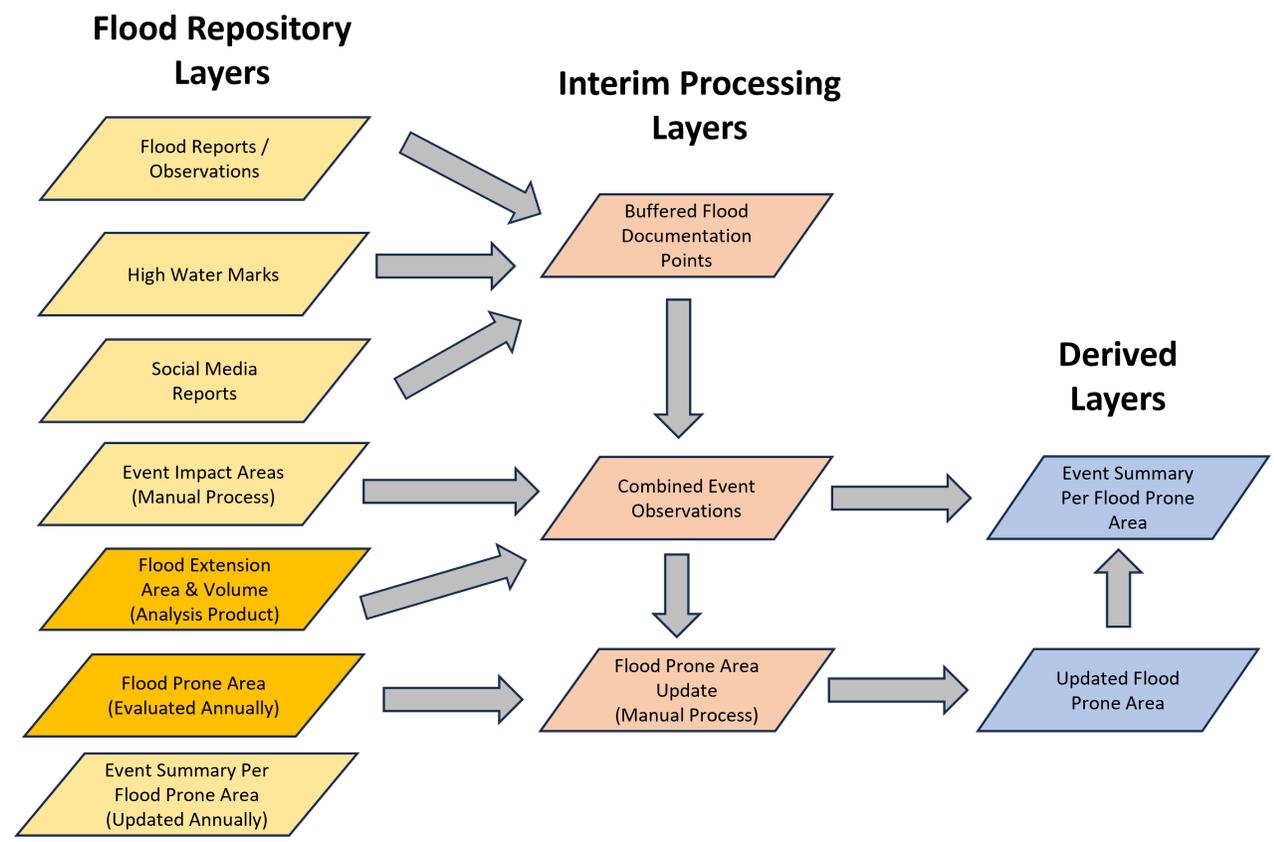


➤ Document, identify and map locations of reported flooding

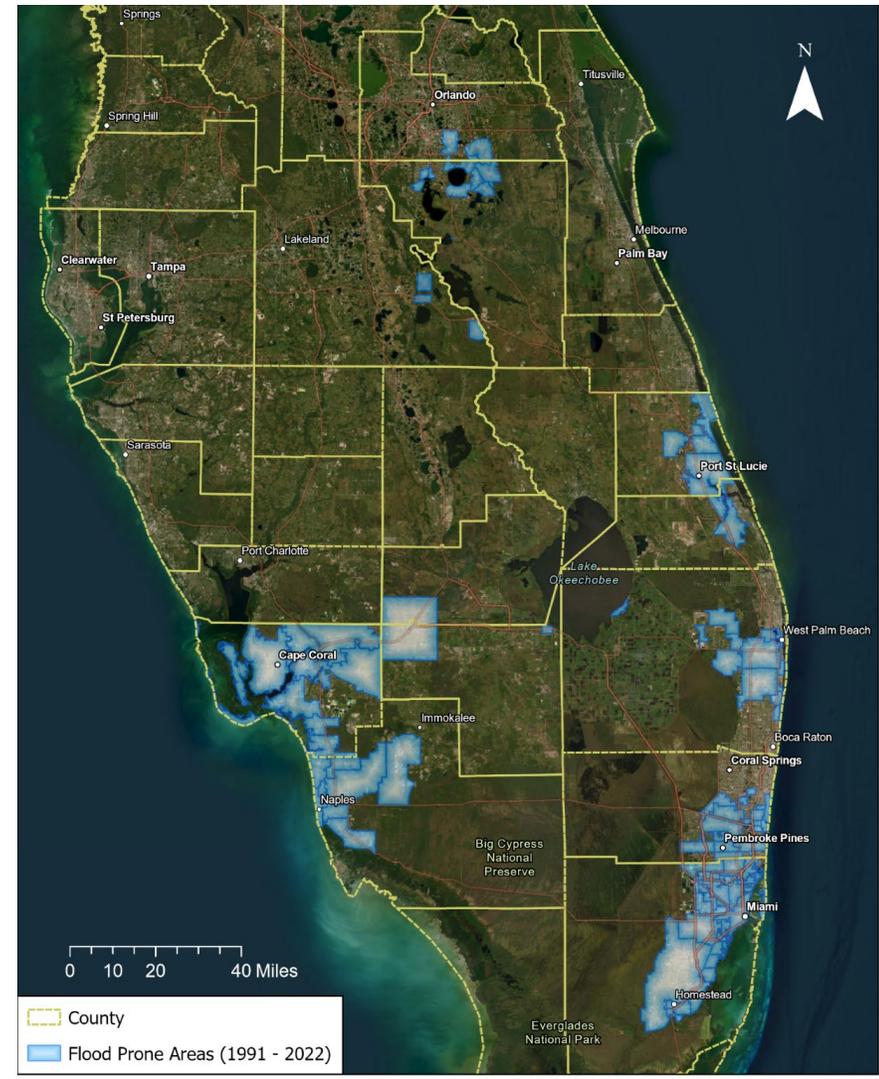
# Event Findings



# Sources and Methods Used to Define Flood Prone Areas



➤ Flood Prone Area = Locations with recurrent flood occurrence associated with rainfall, storm surge, tidal, and compound flooding



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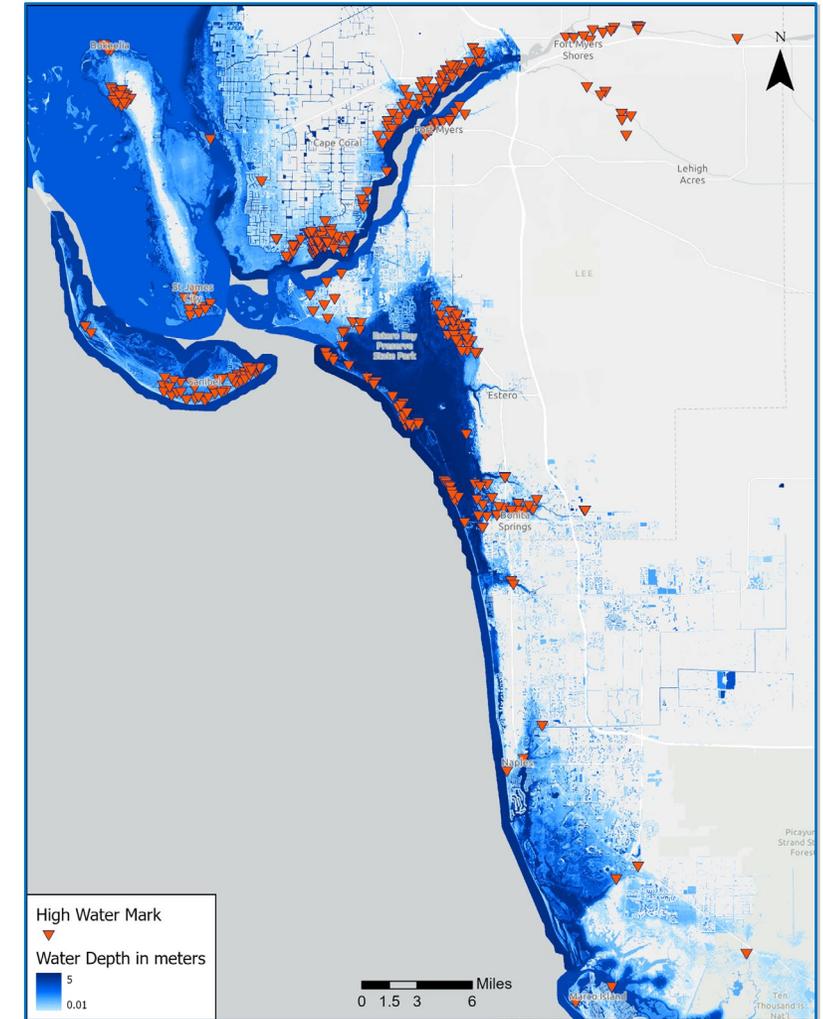
## Flood Extent within a Flood Prone Area



- Flood prone areas will be used to
  - Evaluate monitoring gaps
  - Identify priorities for flood sensors deployment
  - Prioritize satellite / radar image acquisition
  - Focus flood observation and high-water mark data acquisition deployments
  - Define flood extents
- Flood extents will be used to
  - Develop the SFWMD Resilience flood metric
  - Validate Flood Protection Level of Service (FPLOS) models
  - Determine best means to mitigate flood impacts

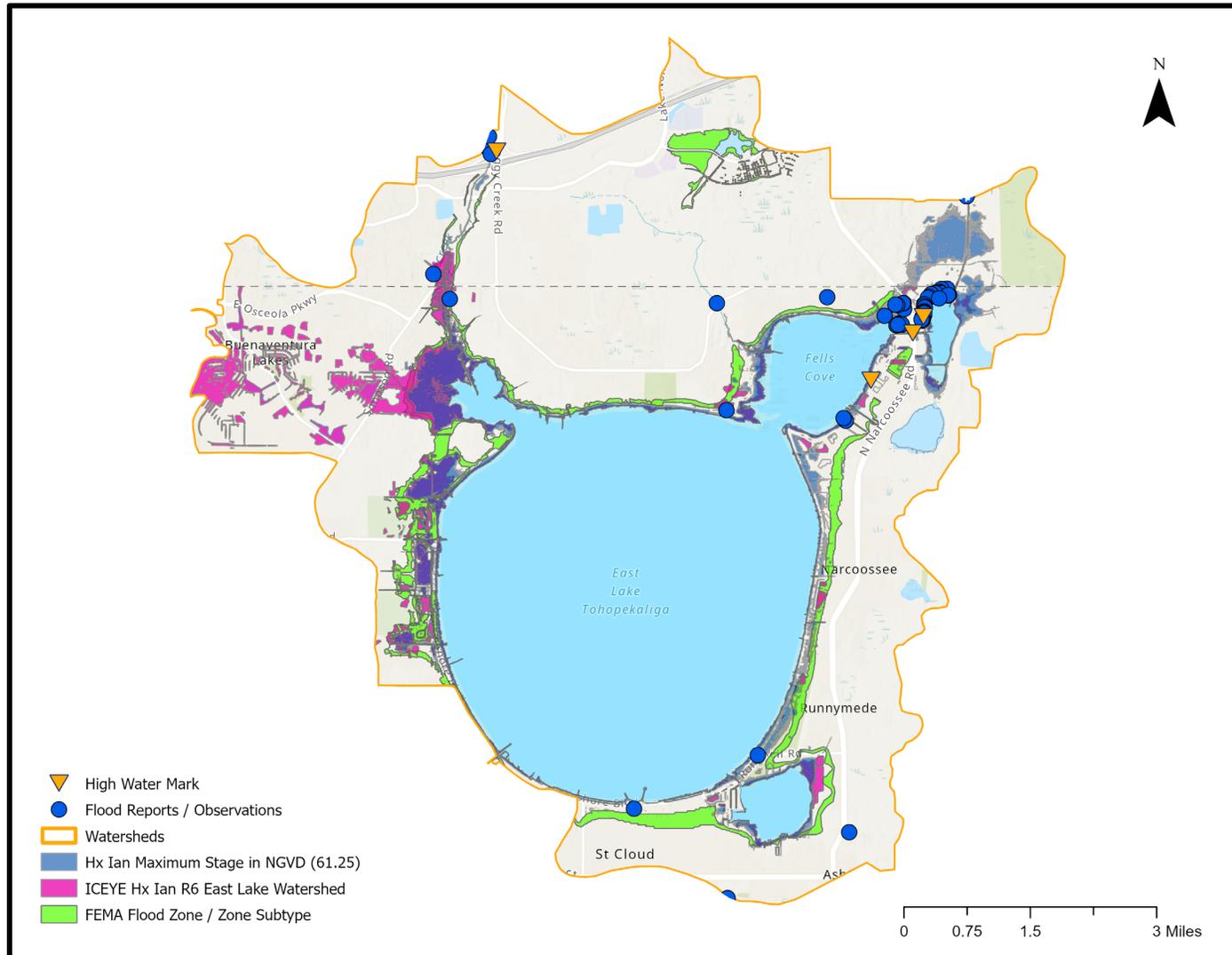
# Sources and Methods Used to Define Flood Extent and Volume for Hx Ian

- ICEYE's Flood Insights Product
  - Processed high resolution (4 meter) Synthetic Aperture Radar (SAR) flood data
  - Maximum flood extent and volume over the duration of an event
- Flood Insight extents were acquired for Hurricane Ian
  - Water management system storage was masked out of flood extents
  - Flood Insight extents in the Upper Kissimmee Basin were evaluated relative to maximum recorded lake stage



ICEYE Flood Insights storm surge extents Hx Ian  
Southwest Florida

# ICEYE Flood Insights Evaluation – East Lake Tohopekaliga Watershed



- Flood extent beyond the regulated water storage footprint was evaluated
- Dark blue areas represent the estimated water surface extent at the maximum recorded flood stage
- Pink areas are extent of flooding identified in the ICEYE Flood Insights product
- Purple areas are overlap in flood estimates
- Green areas are FEMA Flood Zones
- Conclusions:
  - ICEYE Flood Insights captures watershed flooding not measurable through lake gauge data
  - Combination of the two sources provides best estimate of flood impacted areas based on comparison with flood observations and high-water marks

# South Florida Flood Information Resource Hub



South Florida Flood Information Resource

Search, Visualize, Download, Create, Communicate, Collaborate

Search...

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.

# Public Tools

<https://apps.sfwmd.gov/WAB/LocalContactViewer/index.html>

**Who to Contract about Flooding in your area:** Please select the "Local Contact Viewer" text on the right side of the panel below to launch the contact viewer application. Once the application launches, use the panel on the right side of the application to enter an address or location to be returned contact information.

### Local Contact Viewer



#### Local Contact Viewer

Web application to access contact information for drainage districts, municipalities, counties and other organizations responsible for secondary drainage systems.

Share this card 

#### Photos and Flood Observations:

The Document the Floods survey is for stakeholders to capture or upload photos and information about flooding at a location.

To provide information and photos for past events, please contact [Resiliency@sfwmd.gov](mailto:Resiliency@sfwmd.gov).



#### [Document the Floods](#)

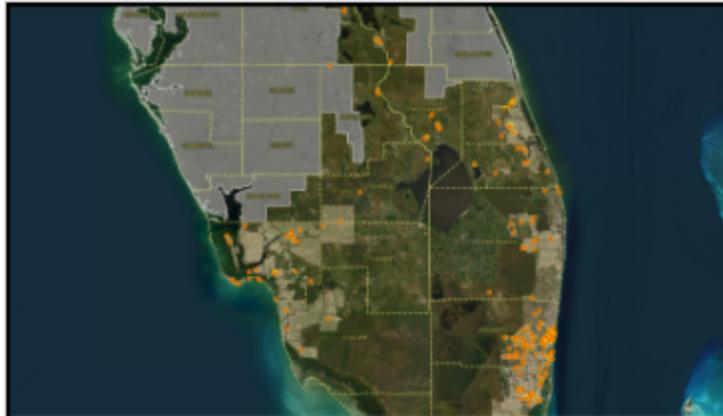
Public survey to document flood events. Also available at [sfwmd.gov\FloodingApp](https://sfwmd.gov/FloodingApp).

[Submit / Capture Photo](#)

[sfwmd.gov/floodingapp](https://sfwmd.gov/floodingapp)

# Public Current Event Viewer

**Current Event Viewer:** Please select the "South Florida Current Event Flood Information Viewer" text on the right side of the panel below to launch the viewer application.



**Current Event Viewer**

## South Florida Current Event Flood Information Viewer

Public viewer application to access current event flood observations and photos.

## South Florida Flood Information Resource Accounts

- Local government staff will need to request access and agree to comply with our data access and use agreement
- Agreement is required to honor data access and use licensing agreements SFWMD has with vendors such as ICEYE
- In 2024, local government staff will have access to
  - SFWMD's High Water Mark Survey (Silver Jacket Derived)
  - "Private" flood reports in areas with restricted sharing policies
  - Flood Repository Application

# Resource Tools

## High Water Mark Survey:

The High Water Mark (HWM) Survey is for SFWMD and local governments to mark and measure flood extents associated with rainfall, storm surge, tidal, and tropical events.

To provide high water marks associated with past events, please contact [Resiliency@sfwmd.gov](mailto:Resiliency@sfwmd.gov).



[SFWMD HWM Survey](#)

SFWMD and Local Government High Water Mark Application

[Take Survey](#)

**Application:** Please select the "South Florida Flood Information Resource Application" text on the right side of the panel below to launch the viewer application.



**SF Flood Information App**

## South Florida Flood Information Resource Application

Web application to view and query flood documentation compiled as part of the SFWMD Water and Climate Resilience Flood Metric.

# Photo Viewer

### Map and List Filter

- ▶ SFWMD AHED Watershed
- ▶ County
- ▶ Municipality
- ▶ Special District
- ▶ Event Name

↻

### Flood Observation Photo

### Observation Details

<b>Event Name: Tropical Storm Alex June 2022</b>	
Collection Date:	June 4, 2022
Event Name:	Tropical Storm Alex June 2022
Event Type:	extreme_heavy_rainfall
Event Type (Other):	Tropical Storm
How deep is flooding?	ankle_deep
How frequently?	
Property Type:	Residential
Affected Area:	
General Observations:	
SFWMD AHED Watershed Name:	NORTH BISCAYNE BAY
Municipality:	NA

### Photo Details

Event Name: Tropical Storm Alex June 2022  
 Collection Date: June 4, 2022  
 Event Type: extreme\_heavy\_rainfall

Photo Viewer
Current Event Viewer
Flood Observation Summary
Social Media Summary
High Water Mark
Flood Prone Areas
Event Summary

# Current Event Viewer

The interface features a central map of South Florida with orange circular markers indicating current flood events. The map includes county boundaries (dashed yellow lines) and Water Management District (WMD) boundaries (solid grey lines). A legend on the left side of the map area includes the following sections:

- Flood Reports / Observations:** Represented by an orange circle icon.
- Flood Prone Areas (1991 - 2022):** Represented by a grey triangle icon.
- County Boundaries:** Represented by a dashed yellow line icon.
- Water Management District Boundaries:** Represented by a solid grey line icon.
- WMD NAME:** A list of five districts with corresponding grey square icons: NFWMD, SFWMD, SJRWMD, SRWMD, and SWFWMD.

At the bottom of the map area, there is a scale bar for 30 miles and a copyright notice: "Earthstar Geographics | SFWMD Geospatial Services | NAVTEQ, SFWMD Geospatial Services". A "Powered by Esri" logo is located in the bottom right corner of the map area. A navigation toolbar with search, home, layers, and zoom icons is positioned in the top right corner of the map area.

Below the map is a navigation bar with the following tabs: "Photo Viewer", "Current Event Viewer" (which is highlighted), "Flood Observation Summary", "Social Media Summary", "High Water Mark", "Flood Prone Areas", and "Event Summary".

# Flood Observation Viewer

### Filter by Year and Event

Year  
2023

Event Name  
Extreme Rain Event November 2023

Watershed Category	Count
C-4	2
C-5	2
C-6	1
C-8	1

Map showing flood observations in Miami area. Labels include MIAMI GARDENS, MIAMI LAKES, OPA-LOCKA, MIAMI SPRINGS, VIRGINIA GARDENS, WEST MIAMI, SOUTH MIAMI, CORAL GABLES, MIAMI BEACH, MIAMI SHORES, BISCAYNE PARK, NORTH MIAMI BEACH, MIAMI GARDENS, MIAMI LAKES, OPA-LOCKA, MIAMI SPRINGS, VIRGINIA GARDENS, WEST MIAMI, SOUTH MIAMI, CORAL GABLES, MIAMI BEACH, MIAMI SHORES, BISCAYNE PARK, NORTH MIAMI BEACH, MIAMI GARDENS, MIAMI LAKES, OPA-LOCKA, MIAMI SPRINGS, VIRGINIA GARDENS, WEST MIAMI, SOUTH MIAMI, CORAL GABLES, MIAMI BEACH, MIAMI SHORES, BISCAYNE PARK, NORTH MIAMI BEACH.

**Total**  
**6**  
**Flood Reports/Observations**

- Extreme Rain Event November 2023

1 of 6

### Observation Details

Event Name: Extreme Rain Event November 2023

Collection Date:	November 16, 2023
Event Name:	Extreme Rain Event November 2023
Event Type:	extreme_heavy_rainfall
Event Type (Other):	Rain
How deep is flooding?:	greater_than_knee_deep
How frequently?:	yes_it_always_floods_here
Property Type:	Residential
Affected Area:	road
General Observations:	

photo-20231116-125520.jpg

Photo Viewer
Current Event Viewer
Flood Observation Summary
Social Media Summary
High Water Mark
Flood Prone Areas
Event Summary



# Event Impact Area Summary

### Filter by Flood Prone Area

Select Flood Prone Area  
ACREAGE

### Flood Prone Area Event List

- Hurricane Frances Aug 2004
- Hurricane Jeanne Sept 2004
- Tropical Storm Isaac Aug 2012**
- Hurricane Ian Sept 2022

### Event Details

**Tropical Storm Isaac Aug 2012**

Event Name:	Tropical Storm Isaac Aug 2012
Event Type:	Extreme or Heavy Rainfall
Event Type (Other):	Tropical Storm
Event Start Date:	8/22/2012
Event End Date:	8/22/2012
Rainfall Amount:	
Antecedent Conditions:	
Property Damage:	
Crop Damage:	
Event Description:	

Photo Viewer
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## Next Steps

### ➤ Encourage Government partners to

- Adopt and promote public use of the South Florida Flood Observation Survey
- Agree to train staff on identifying, marking, and entering high water marks in the SFWMD high water mark survey
- Collect high water marks when staff are deployed to investigate flood reports and conditions

# Questions