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## South Florida Water Management District

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### RESILIENCY COORDINATION FORUM AGENDA

February 28, 2024  
9:00 AM

District Headquarters - B-1 Auditorium  
3301 Gun Club Road  
West Palm Beach, FL 33406

FINAL REVISED

1. Opening Remarks - Jennifer Smith, Chief of Staff, SFWMD
2. Statewide Office of Resilience - Wes Brooks, Ph.D., Chief Resilience Officer, State of Florida
3. District Resiliency Updates - Carolina Maran, Ph.D., P.E., Chief of District Resiliency, SFWMD
4. 2024 Legislative Update - Phil Flood, Principal External Affairs Specialist, SFWMD
5. National Oceanic and Atmospheric Administration (NOAA) Atlas 15 - Kenneth Kunkel, Ph.D., Senior Scientist and Research Professor, North Carolina State University
6. Break
7. Florida Flood Hub Update - Thomas K. Frazer, Ph.D., Dean and Professor, University of South Florida
8. C&SF Flood Resiliency Study Updates - Tim Gysan, P.E., Resilience Senior Project Manager, USACE; Eva Velez, P.E., Chief, Ecosystem Branch, USACE
9. 2024 Wet Season Flood Information Resources
  - A. South Florida Flood Information Resource, Tools and Training for the Upcoming Wet Season - Christine Carlson, Geospatial Architect, SFWMD
  - B. Flood Insights for Florida - Mark Antonik, Strategic Account Manager, ICEYE; Mike Bennett, Head of North America Government Solutions, ICEYE; and Jin Lee, Client Success Manager, ICEYE

C. Flood Tracking in South Florida - Julia Kumari Drapkin, CEO and Founder, ISeeChange

10. Around the Table Updates from Local, Tribal and State Agencies
11. Public Comment
12. Closing Remarks - Carolina Maran, Ph.D., P.E., Chief of District Resiliency, SFWMD
13. Adjourn

Presentations for Agenda Items 3, 4, 5, 7, 8, 9A, 9B and 9C: (Staff contact, Yvette Bonilla)

**Agenda Item Background:**

[3 District Resiliency Updates](#)

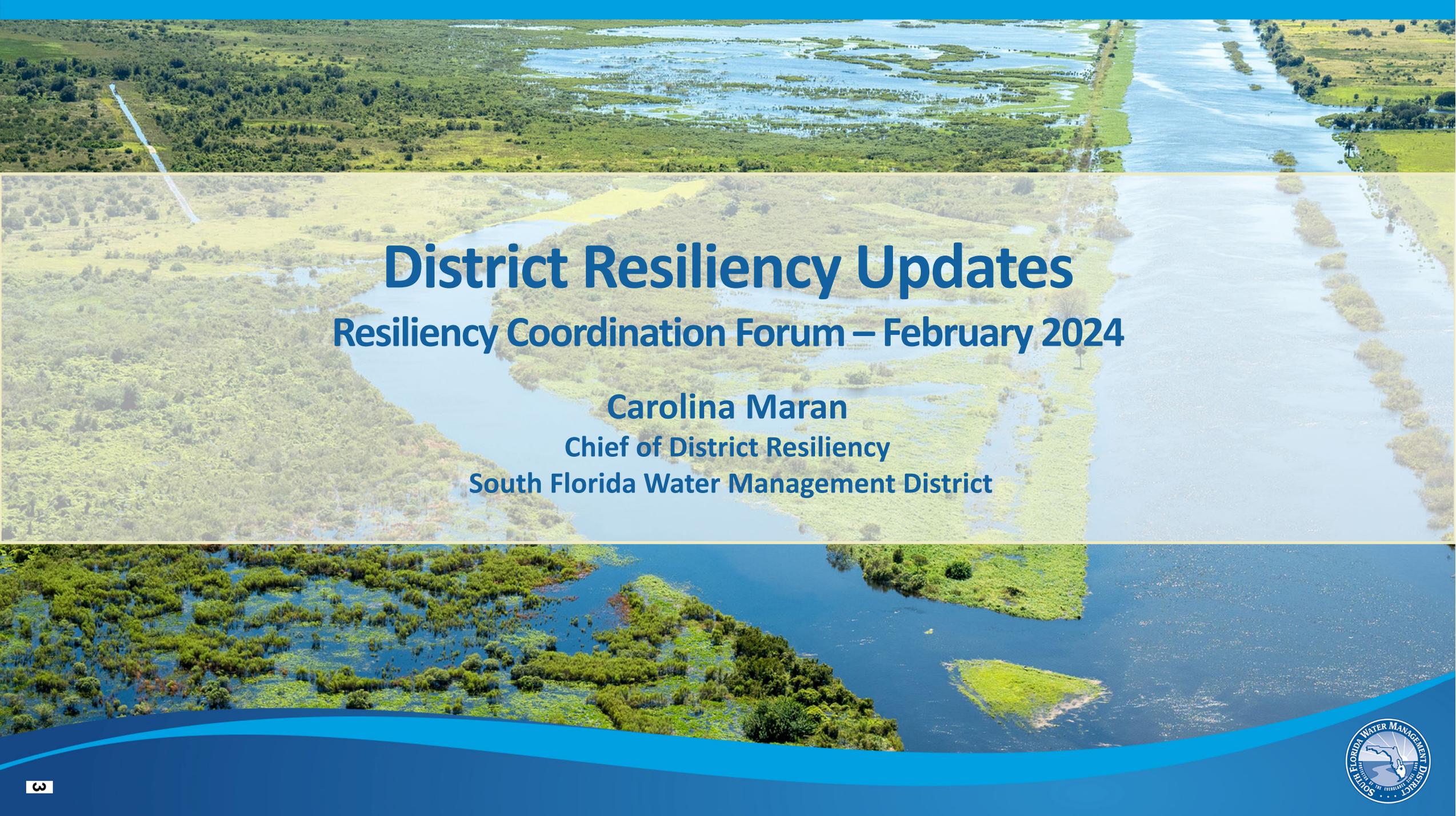
[4 2024 Legislative Updates](#)

[5 NOAA Atlas 15](#)

[7 Florida Flood Hub Update](#)

[8 C&SF Flood Resiliency Study Updates](#)

[9 2024 Wet Season Flood Information Resources](#)



# District Resiliency Updates

## Resiliency Coordination Forum – February 2024

**Carolina Maran**  
Chief of District Resiliency  
South Florida Water Management District

# Critical Elevations Data Request

## From the November 29th Forum Discussions

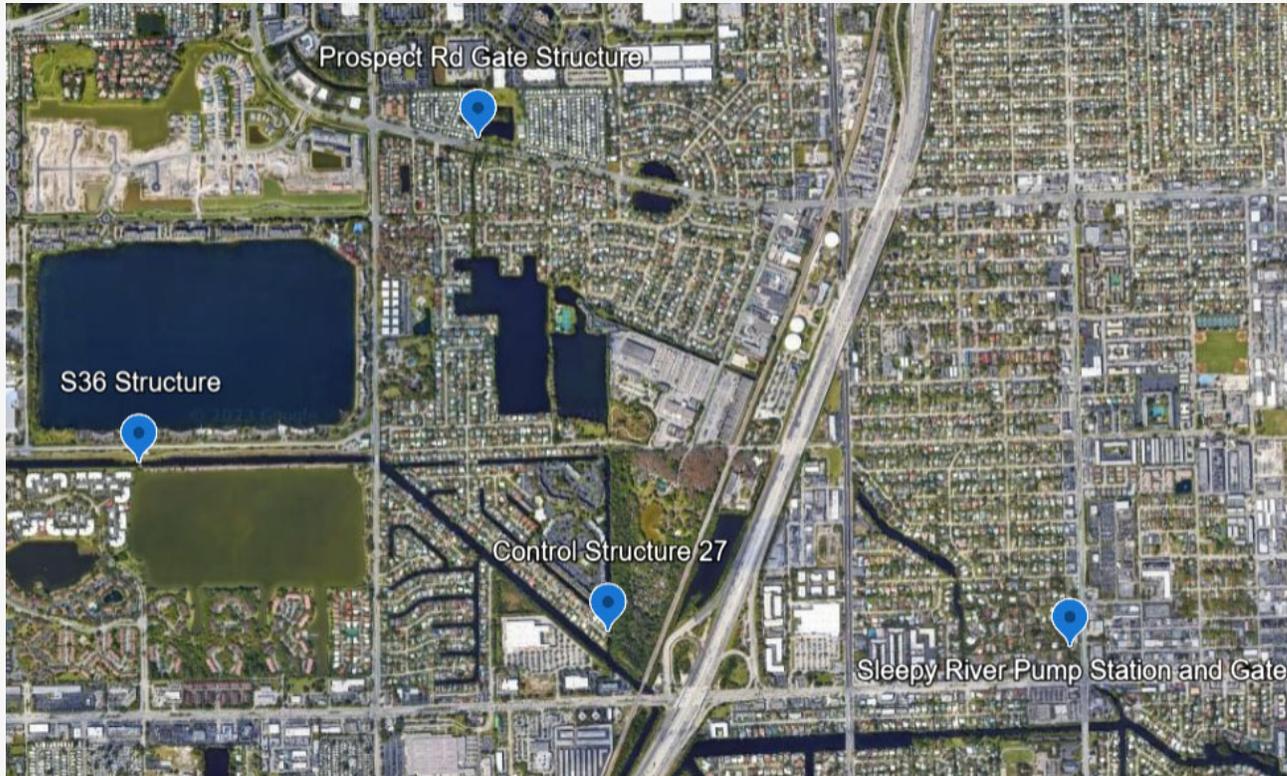


Image Courtesy of City of Oakland Park

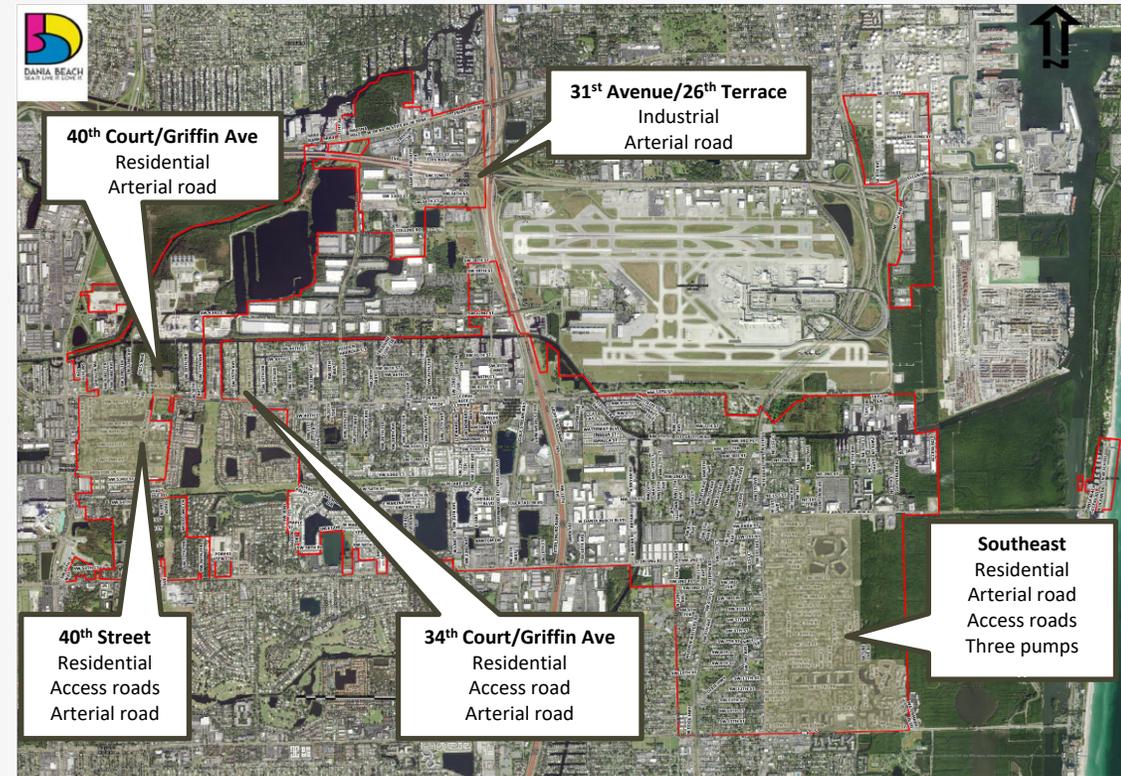


Image Courtesy of City of Dania Beach

# Critical Elevations Data Request

## From the November 29th Forum Discussions

- **Defining Critical Elevations:** We define critical elevations as those at primary and secondary canals that could exacerbate flood risks within drainage basins. These risks extend beyond street flooding, impacting finish floor elevations, and causing limited road access, particularly for emergency vehicles.
- **Request Details:** Please provide all relevant critical elevations and associated durations, along the primary canals (applicable both upstream and downstream of coastal structures) and secondary canals. In addition, please detail vulnerable areas/locations within the respective drainage basin that would be affected if the critical elevation is exceeded and add a brief description of local operational issues/limitations.

# Critical Elevations Request

## From the November 29th Forum Discussions



### Interagency Canal Critical Elevations Data Tracking Sheet

Directions: Please provide information by 2/16/24 to [resiliency@sfwmd.gov](mailto:resiliency@sfwmd.gov)

County	Agency/ District Name	Canal Name	Primary / Secondary System	Canal Operator	Gauge Name (if existing)	Location of Elevation Measurement Lat/Long (Decimal Degrees)	Critical Elevation (Note if NAVD/NGVD)	Duration	Areas/Locations Impacted if Critical Elevation is Exceeded (Name Neighborhood/Community or Lat/Long)
Osceola	City of St. Cloud	C-31 Canal	2nd Street Ditch	SFWMD		28.259; -81.315	57.2 NGVD	Multiple days/weeks during last hurricane	Blackberry Creek; Commerce Center Drive
Osceola	City of St. Cloud	Ohio Lateral Ditch	C-31	FDOT		28.246; -81.312	65 NGVD	Structural flooding during Hurricane Ian	Cypress Court
Osceola	City of St. Cloud	Gator Bay Slough	Lake Toho	Osceola County		28.201; -81.282	73.7 NGVD	approx. 1 day	Bayview Lane
Osceola	City of St. Cloud	Gator Bay Slough	Lake Toho	Osceola County		28.177; -81.292	69.3 NGVD	approx. 1-2 days	Moon Dancer
Osceola	City of St. Cloud	Gator Bay Slough	Lake Toho	Osceola County		28.180; -81.298	68.1 NGVD	approx. 1 day	Pixie Lane

### Initial Responses received from:

- Seminole Tribe of Florida
- Okeechobee County
- Polk County
- St. Lucie County
- Osceola County
- City of Fort Lauderdale
- City of Cape Coral
- City of St. Cloud
- City of Pompano Beach
- City of Oakland Park
- City of Dania Beach
- Northern Palm Beach county Improvement District
- Coral Springs Improvement District
- Spring Lake Improvement District



# Water and Resilience Climate Metrics Updates

- **South Florida Environmental Report (SFER)** Chapters will be published on March 1<sup>st</sup> and Open House on April 10-11
  - [sfwmd.gov/SFER](https://sfwmd.gov/SFER) (Chapters 2A and 2B)
  - [sfwmd.gov/meetings](https://sfwmd.gov/meetings)
- **Sub-daily Rainfall Trends and Drought Projections** under development, in collaboration with USGS/FIU to support upcoming Water Supply Vulnerability Assessment and other ongoing Flood Vulnerability Assessments
- **Year 2 Enhanced NOAA Tide Predictions**, in collaboration with UM Rosenstiel School (new global climate model, one potential new west coast site )
- Ongoing Collaboration with the **Florida Flood Hub** on **Statewide Rainfall Projections**



# Resiliency Planning: 2024 Updates

## 2023 Consolidated Annual Report on Flood Resiliency

Central and Southern Florida Flood Resiliency  
Study

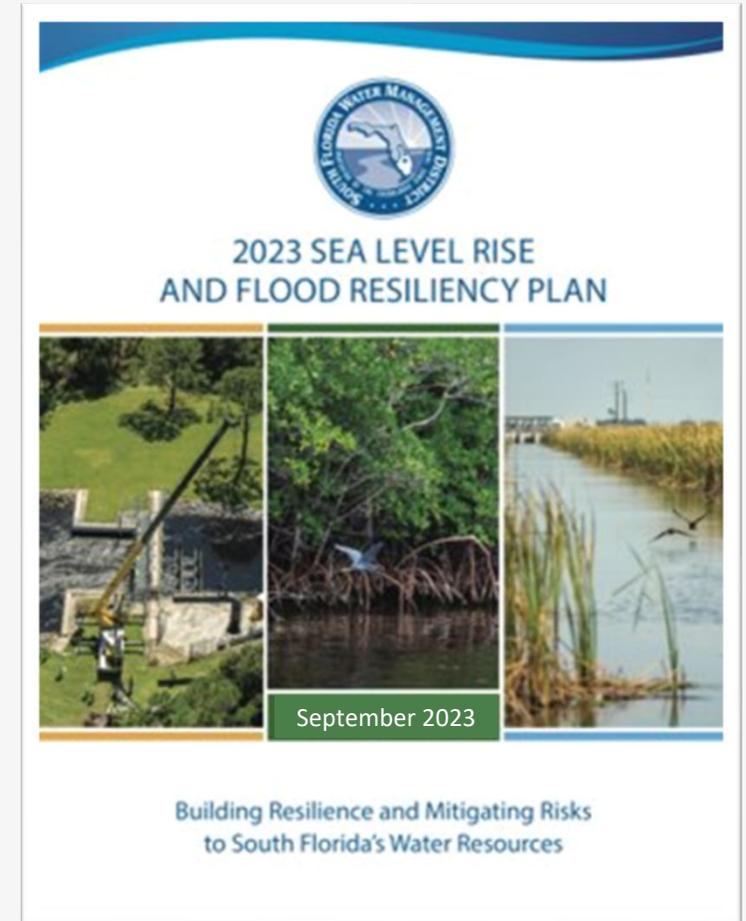
Sea Level Rise and Flood Resiliency Plan

October 2023



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

**Draft Version to be shared and  
open for comments at the  
upcoming Forum on May 29**



# Grant Proposals

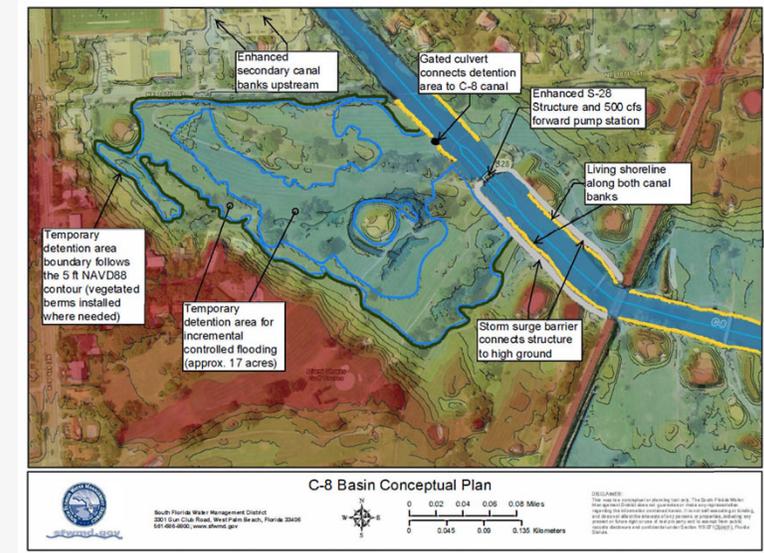
- Further exploring project partnership opportunities in 2024
- Initial coordination meetings with partner agencies
- Resilient Florida, FEMA BRIC and other HGMP (DR), Florida Commerce, NOAA, others.



# Projects/Grant Implementation

## Ongoing Coordination with:

- **FDEP on Resilient Florida Implementation Grants – 2** Agreements Executed; Anticipated execution this month of additional grant agreement for Corbett Levee.
- **FEMA/FDEM** to advance **FEMA BRIC** implementation (no draft agreements received for FY21 and FY22 recommended grants)
- **FDEP Innovative Tech Grant** – Finalizing workplan in collaboration with Miami-Dade County
- **FDEP on Resilient Florida Planning Grant - FPLOS Phase I** Studies initiated for Martin/St. Lucie Counties - currently being expanded to include Adaptation Planning



# USACE-SFWMD Resiliency Coordination Efforts

- **C&SF Flood Resiliency Study:**
  - Future Without Runs and Upcoming Performance Metrics Public Workshop on March 6<sup>th</sup> and 7<sup>th</sup>
  - Study Funding Limitations and Counties Support
- **C&SF Comprehensive Study**
  - Waiting for Implementation Guidance
  - Review of FS Cost-Share Agreement Template
  - Compound Flood Proposal being evaluated by ERDC



**US Army Corps  
of Engineers®**  
Jacksonville District



[www.sfwmd.gov/C&SF](http://www.sfwmd.gov/C&SF)





**Executive Committee**

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Hon. Quentin "Beam" Furr,  
2<sup>nd</sup> Vice Chair  
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Immediate Past Chair

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Dat Huynh, FDOT  
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**Executive Director**

Isabel Cosio Carballo, MPA

**Legal Counsel**

Samuel S. Goren, Esq.  
Goren, Cherof, Doody &  
Ezrol, P.A.

February 1, 2024

The Honorable Daniella Levine Cava  
Mayor, Miami-Dade County  
111 NW 1<sup>st</sup> Street, 29<sup>th</sup> Floor  
Miami, Florida 33128

The Honorable Nan Rich  
Mayor, Broward County  
County Commissioner &  
Former State Senator  
115 South Andrews Avenue, #421  
Fort Lauderdale, Florida 33301

The Honorable Oliver Gilbert, III  
Chairman, Miami-Dade County Board  
of County Commissioners  
111 NW 1<sup>st</sup> Street, Suite 220  
Miami, Florida 33128

Re: County Funding Effort needed for Flood Protection / Salinity Control Structures

Dear Mayor Rich, Mayor Levine Cava, and Chairman Gilbert:

At the Council's recent Board Meeting, the Council Members met with the Chief Resiliency Officers and staff from Broward County (Dr. Jurado), Miami-Dade County (Mr. Murley), South Florida Water Management District (Dr. Maran), and U.S. Army Corps of Engineers (ACOE), Jacksonville District (Mr. Gysan, P.E., Ms. Veléz, P.E., and Major Cory Bell). Following a presentation by Dr. Jurado, the Council Members discussed the current and foreseeable failure of flood protection / salinity control structures in Miami-Dade County and Broward County and the need to work in partnership with the South Florida Water Management District to provide local funding to advance Level 3 Engineering Studies.

In summary, there are 23 flood control / coastal salinity structures in Broward (7) and Miami-Dade (16). Absent retrofitting and/or replacement, and complementary infrastructure investments, these structures are failing, or are expected to fail in the foreseeable future, to provide regional flood protection. Of these, three structures have received some level of partial funding. Four additional structures, two in each county, are under consideration for funding through the ongoing C&SF Flood Resiliency Study by the ACOE / SFWMD leaving 16 FPLOS Phase I structures without funding for the Level 3 Engineering Studies required to qualify for federal funding. Without these Level 3 Engineering Studies, funding for infrastructure replacement and/or improvements are likely to extend past 2032 at the earliest. To move these studies forward, the counties are proposing to collaborate with SFWMD to conduct the Level 3 Engineering Studies for the anticipated 5 unfunded structures in Broward and 11 structures in Miami-Dade.

1 Oakwood Boulevard, Suite 250 | Hollywood, Florida 33020 | 954-924-3653 | www.sfrgionalcouncil.org

The SFWMD is able to undertake these studies expeditiously and at an estimated cost of \$1.5 million per structure. The payment would be spread over two years. This translates to an expenditure by Broward County of \$7.5 million and \$16.5 million by Miami-Dade County over two years, or \$3.5 million and \$8.25 million per year respectively.

Given the urgency of this matter for the region, its residents, and economy, the Council recommends that the counties undertake and fund the studies for the 16 remaining FPLOS Phase 1 Control Structures in partnership with the SFWMD. It is critically important to fast track this work and submit it for Federal Funding (project authorization and appropriations) on an expedited schedule. It is also important to convey to the U.S. ACOE and SFWMD the importance of moving forward with the C&SF Flood Resiliency Study for a minimum of 4 Flood Control / Coastal Salinity Structures; two each in Miami-Dade and Broward. A unified regional voice and local funding will assist both the SFWMD and U.S. ACOE, Jacksonville District in moving this critical work forward at the federal level.

Additional materials accompany this correspondence for your review and information. In addition, you can view the meeting presentation and conversation at [https://youtu.be/kMeXRdhl\\_7I?si=2HRqlaEbZSm9ol4w](https://youtu.be/kMeXRdhl_7I?si=2HRqlaEbZSm9ol4w). Please do not hesitate to let me or Isabel Cosio Carballo, Executive Director, know if we can provide you with additional information or otherwise be of assistance to you.

Sincerely yours,

Steve Geller  
Chair, SFRPC  
Broward County Commissioner & Former State Senator

Enclosures

ICC/JMJ

cc Jimmy Morales, Chief Operating Officer, Miami-Dade County  
Monica Cepero, County Administrator, Broward County  
Jennifer Jurado, Ph.D., Deputy Director & Chief Resiliency Officer, Broward County  
James F. Murley, Chief Resiliency Officer, Miami-Dade County  
Drew Bartlett, Executive Director, SFWMD  
Ana Carolina Coelho Maran, P.E., Ph.D., District Resiliency Officer, SFWMD  
Colonel James Booth, District Commander, U.S. ACOE, Jacksonville District  
Mayor Cory J. Bell, Deputy District Commander for South Florida, U.S. ACOE  
Eva B. Velez, P.E. Chief Ecosystem Branch, U.S. ACOE  
E. Timothy Gysan, P.E., PMP, Senior Project Manager, Ecosystems Branch, U.S. ACOE  
Council Members, South Florida Regional Planning Council  
Isabel Cosio Carballo, MPA, Executive Director, SFRPC

# Update on the Central & Southern Florida Flood Risk Study – Status and Timing

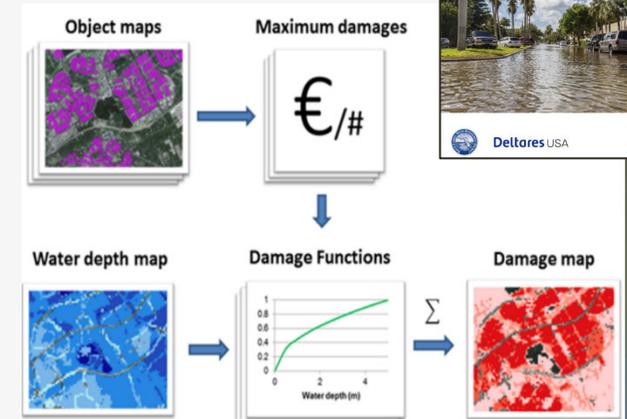
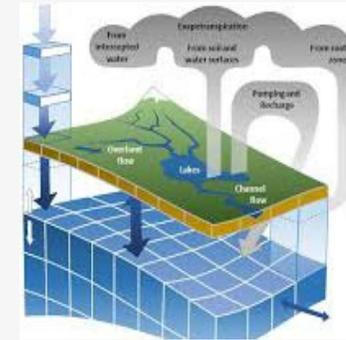
South Florida Regional Planning Council Meeting

January 22, 2024



# Other Relevant Recent Updates

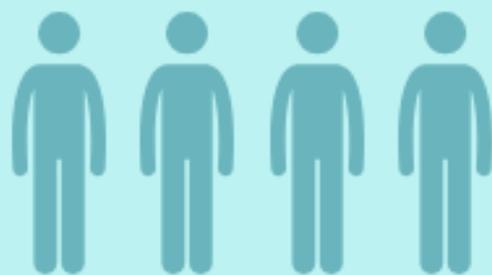
- Flood Risk Modeling (Silver Jackets / WMDs)
- Flood Vulnerability Assessments and the need for advanced H&H tools in South Florida
  - minimum requirements to represent surface-subsurface interactions; water control structures operational rules; overall low-lying flat areas
  - One-pager being developed, and we welcome your input





# District RESILIENCY

## 4 Years at a Glance



**4 Million  
People**

directly and indirectly  
benefited by the projects under  
implementation



**\$340M**

in grant award funds, including  
District's match



**14 Grants**

awarded with contracts  
being executed



**25**

**Partner  
Agencies**



**2407**

**Stake-  
holders**



# District RESILIENCY

## 4 Years at a Glance



**38**  
Priority  
Projects

identified and described in the  
2023 Sea Level Rise and Flood  
Resiliency Plan

**9 H&H**  
Model  
Reviews



in support of flood vulnerability  
assessments and being leveraged by  
the C&SF Flood Resiliency Study



**15**  
documented  
Water and Climate  
Resilience Metrics



**8**  
observed trends  
fully automated with  
real time data access



**14**  
observed trends  
scientifically  
described in the SFER



# District RESILIENCY

## 4 Years at a Glance



### South Florida Flood Information Resource Hub

launched, with 600+ past  
flood observation datapoints  
compiled by flood prone areas



### 2 Metrics Future Projections

derived from global climate  
models to inform rainfall and tide  
scenario formulation

## Building Resilience in South Florida Now and in the Future

# We are hiring!

- **2 new positions within the Office of District Resiliency**
  1. Resiliency Planning Manager\*
  2. Resiliency Project Manager (Implementation)\*

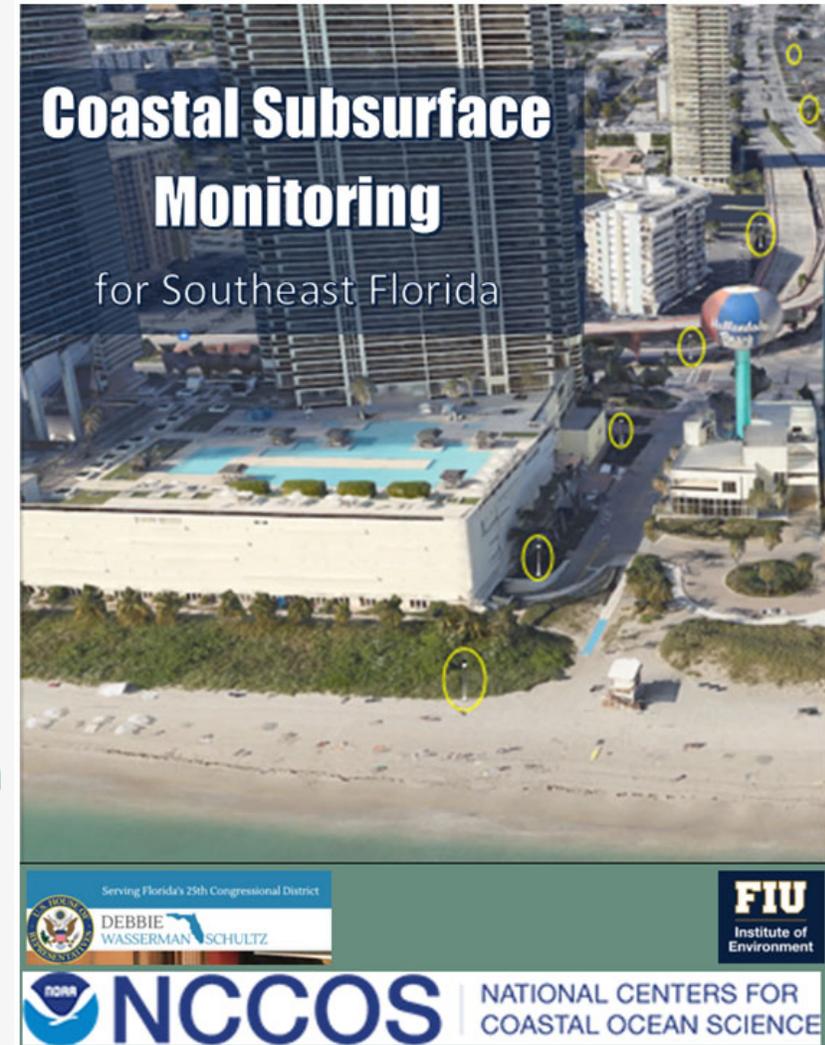
\*to be posted

- Visit [sfwmd.gov/careers](https://sfwmd.gov/careers) for more information

# Upcoming Events

- February 28<sup>th</sup> (today) and 29<sup>th</sup> (tomorrow) – **Southwest Florida Climate Summit** <https://www.chnep.org/climate-summit>
- March 5<sup>th</sup> – **South Florida Hydrologic Society**  
Near-shore Coastal Subsurface Monitoring for Southeast Florida, by Dr. Mike Sukop, Professor, Florida International University at Weston Wing Plus, 1354 SW 160<sup>th</sup> Ave, Weston FL - 5:30pm
- March 7<sup>th</sup> (1PM) & 8<sup>th</sup> (8:30AM) – **USACE/SFWMD C&SF Flood Resiliency Study Virtual Public Workshops\***
- March 26<sup>th</sup> to 29<sup>th</sup> **NOAA Climate Diagnostics and Prediction Workshop**, Tallahassee, FL <https://www.weather.gov/climateservices/cpasw>
- April 10<sup>th</sup> & 11<sup>th</sup> – **SFWMD SFER Open House @ SFWMD HQ**
- May 29<sup>th</sup> – **SFWMD Resiliency Coordination Forum**

\*different agenda on each day





# Thank You

**Carolina Maran, P.E., Ph.D.**

Chief of District Resiliency

[cmaran@sfwmd.gov](mailto:cmaran@sfwmd.gov)

[www.sfwmd.gov/resiliency](http://www.sfwmd.gov/resiliency)



# 2024 Legislative Session Update on Resilience

Phil Flood  
Legislative Liaison / External Affairs Specialist  
February 28, 2024



# 2024 Legislative Session

Legislature began January 9  
March 8 is last day of Regular Session

## 1954 Legislative Bills Filed

- 708 Bills Never Heard in Committee
- 32 Presented to Governor for his Consideration, 2 Signed into Law
- Approximately 650 Bills Still in Play

Over 60 Bills Reference Resiliency, Flooding, Sea Level Rise or Climate Change

# Legislative Bills of Interest

## SB 298 Local Government Coastal Protections

Restricts new coastal construction control measures and amends funding provisions for saltwater intrusion vulnerability assessments.

- Authorizes DEP to provide grants for coastal counties to conduct saltwater intrusion vulnerability assessments.
- Specifies that saltwater intrusion vulnerability assessments must include an analysis of the county's primary water utilities, current maps, projections of intrusion over the next decade, and costs to relocate impacted freshwater wellfields.
- Obligates DEP to use vulnerability assessment information to update the statewide flood vulnerability and sea level rise dataset and provide a 50 percent cost-share funding up to \$250,000 for each grant.

**Status: Awaiting Senate vote**

# Legislative Bills of Interest

**SB 1526/HB 1647 Local Regulation of Nonconforming and Unsafe Structures**  
Establishes the "Resiliency and Safe Structures Act" aimed at regulating the demolition and redevelopment of certain nonconforming or unsafe structures.

**Status: Awaiting Senate vote, awaiting House vote**

# Legislative Bills of Interest

## HB 1581 Mangrove Replanting and Restoration

Mandates DEP to adopt new rules for mangrove replanting and restoration, along with conducting a statewide feasibility study on utilizing mangroves for flood insurance benefit.

- Assist in Everglades restoration and support Biscayne Bay revitalization, including living shoreline designs.
- Support partnerships with local governments for coastal protection projects under the Resilient Florida Grant Program.
- Conduct a feasibility study on using mangroves for coastal flood risk reduction to potentially lower insurance premiums and enhance community ratings.

**Status: Awaiting House vote**

# Legislative Bills of Interest

## HB 1557/SB1368 Department of Environmental Protection

The bill amends various Florida Statutes to enhance environmental protection and management, particularly focusing on aquatic conservation, water management, and wastewater treatment.

- Requires water management districts to develop rules promoting reclaimed water use and encouraging quantifiable potable water offsets.
- Defines "Florida Flood Hub" and revises terms and requirements concerning the Resilient Florida Grant Program and the statewide flood vulnerability and sea level rise assessment.

**Status: Passed by House, awaiting Senate vote**

# Legislative Bills of Interest

## HB 1417/SB 1638 Funding for Environmental Resource Management

Allocates revenue from the Seminole Tribe gaming compact to environmental and water quality initiatives.

- Requires a specified percentage of revenue share payments for Florida wildlife corridor, land management, invasive species removal, the Statewide Flooding and Sea Level Rise Resilience Plan and water quality improvements.
- The lesser of 26.042 percent or \$100 million each fiscal year to the Resilient Florida Trust Fund.

# Legislative Bills of Interest

## HB 1417/SB 1638 Funding for Environmental Resource Management - cont.

- For the 2024-2025 fiscal year, the sum of \$100 million for the Statewide Flooding and Sea Level Rise Resilience Plan pursuant to s. 380.093, Florida Statutes.
- For the 2024-2025 fiscal year, the sum of \$150 million to the South Florida Water Management District for operations and maintenance responsibilities.

**Status: Passed by House, awaiting Senate vote**

# Legislative Bills of Interest

**HB 5001/SB 2500      General Appropriations Act**

House:      \$115,547,289,055

Senate:      \$115,939,248,697

**Status: Currently in Budget Conference**

# Governor Ron DeSantis Budget

## Focus on Florida's Future FY 2024-25 Budget

**\$875 million for Protection of Water Resources**

- **\$745 million Florida's Everglades**

**\$150 million Central & South Florida Infrastructure**

**\$157 million Resilient Florida Program**

- **\$100 million implementation of statewide resiliency projects**
  - **\$57 million planning and coral reef protection**

**\$50 million Beach Management Program**

# 2024 Legislative Update

## Questions?

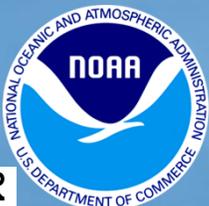


# Scientific Challenges for NOAA Atlas 15 Projections of Heavy Rainfall Design Values

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*Kenneth E. Kunkel*

*Atmospheric Sciences Professor, Dept of Marine, Earth and Atmospheric Sciences  
Lead Scientist for Assessments, North Carolina Institute for Climate Studies  
North Carolina State University*



**OWP** | OFFICE OF  
WATER  
PREDICTION

# The Basics

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The six Assessment Reports of the Intergovernmental Panel on Climate Change and the 5 U.S. National Climate Assessment Reports have been uniform in projecting increases in extreme precipitation if the globe continues to warm



# The Basics

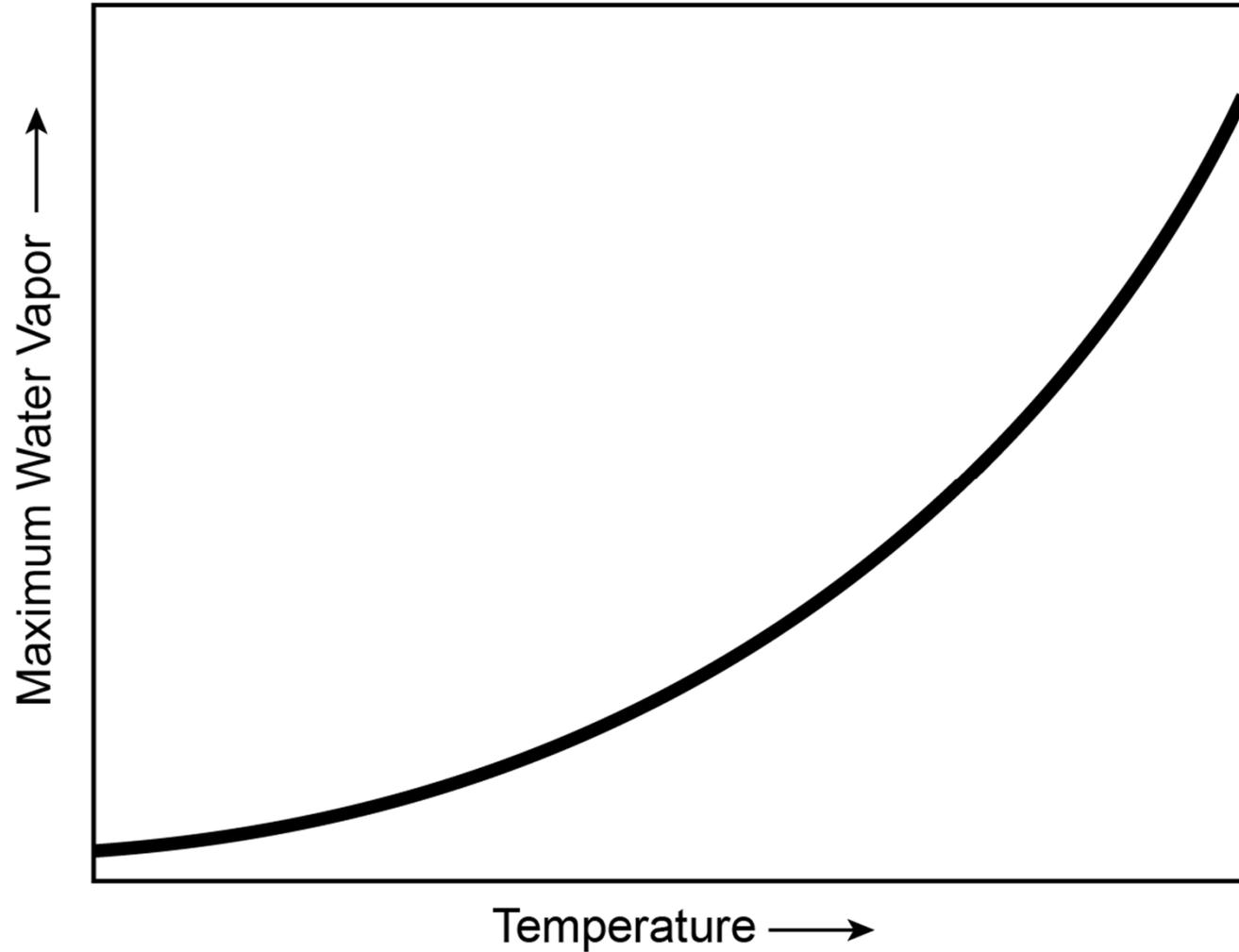
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- Why?
  - The potential for increased atmospheric moisture content due to the Clausius-Clapeyron relationship



# Warmer -> (Potentially) Moister

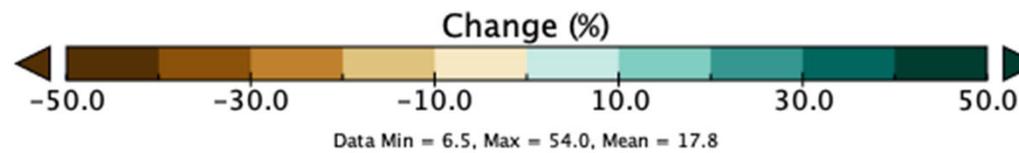
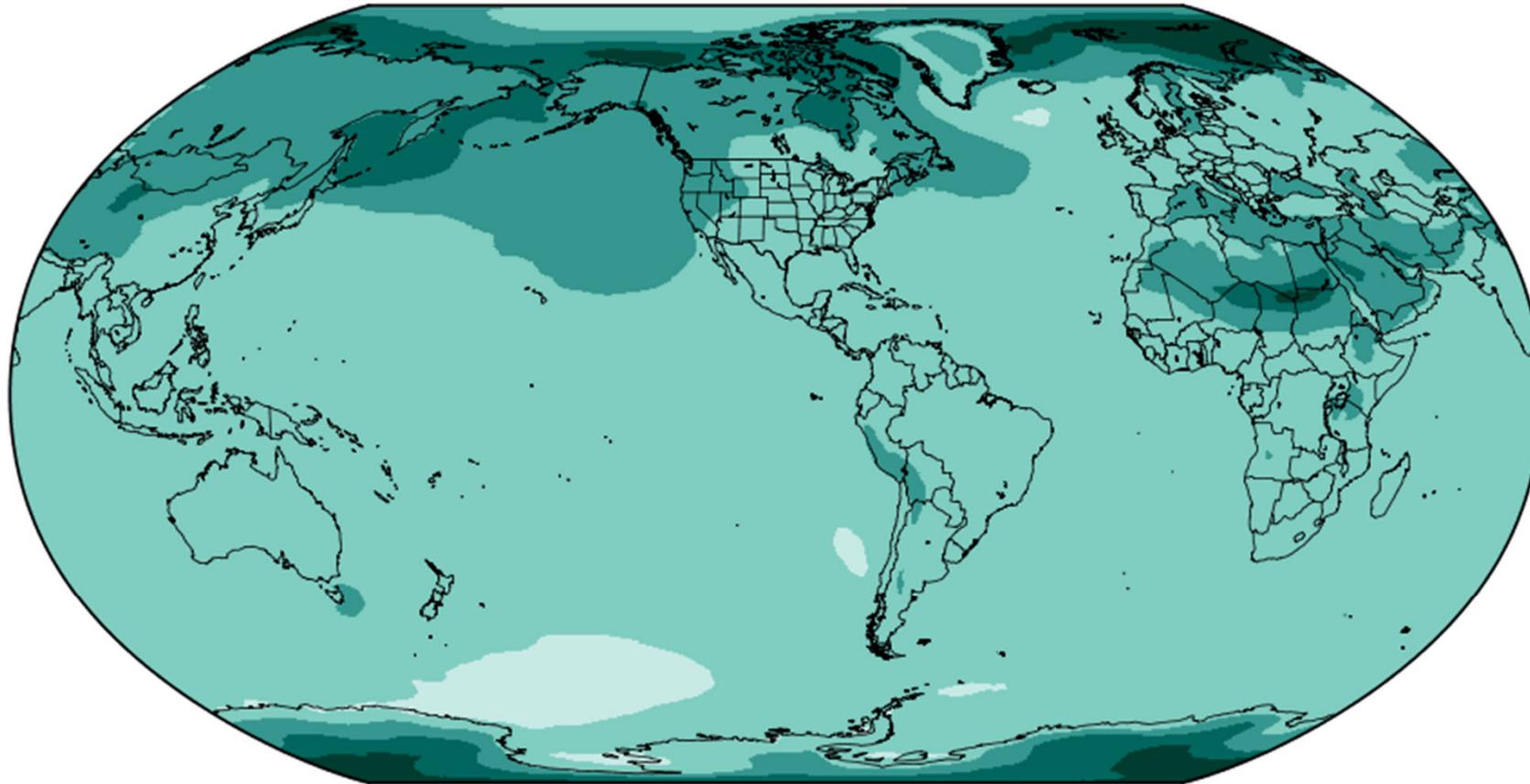
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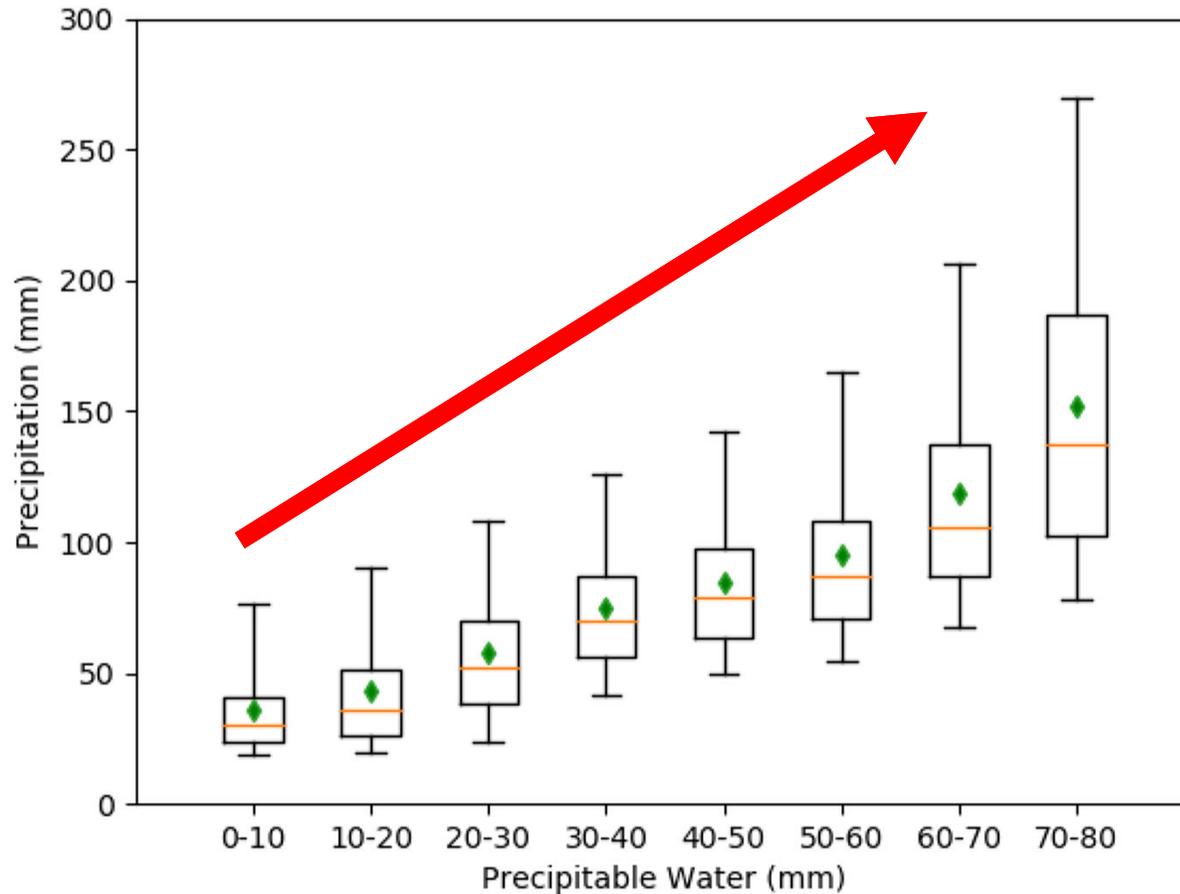
Clausius-Clapeyron relationship: Maximum (saturation) water vapor increases by about 7% per °C

# CMIP6 Projections

CMIP6 Projected Change [(2070–2099)] minus (1985–2014)], SSP3–7.0  
Annual Maximum Daily 2m Specific Humidity



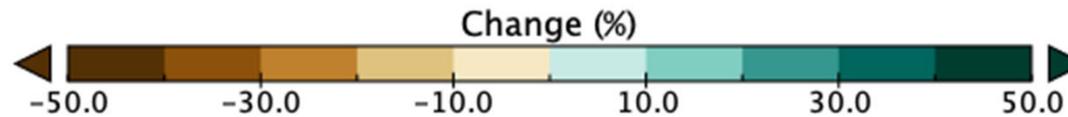
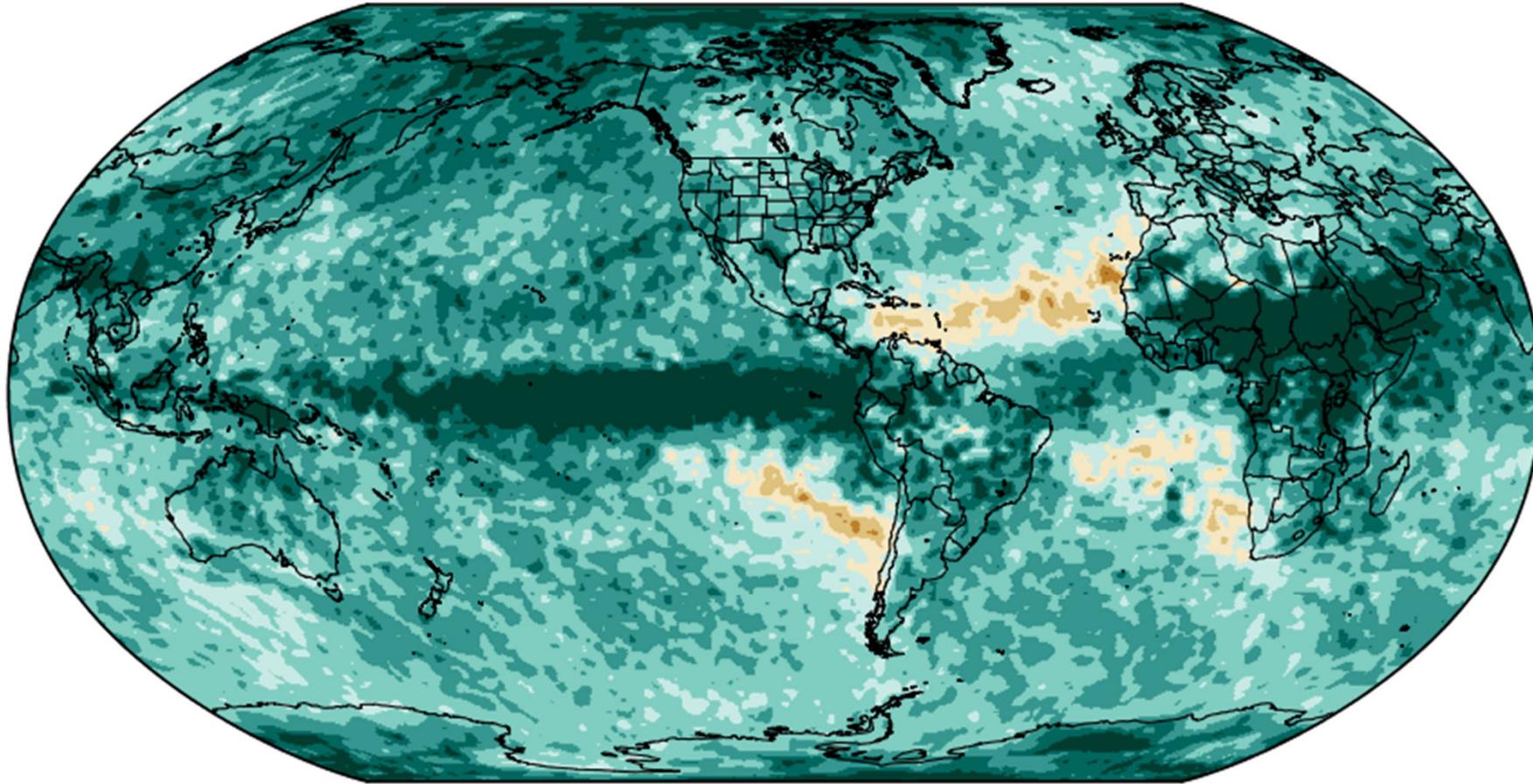
# Extreme Precipitation Amounts vs Water Vapor



**Over CONUS, heavy precipitation amounts on average increased monotonically with precipitable water**

# CMIP6 Projections

CMIP6 Projected Change [(2070–2099) minus (1985–2014)], SSP3–7.0  
30-yr Extreme Daily Precipitation



Data Min = -32.1, Max = 178.7, Mean = 23.5



## Magnitude of Increases

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- An exact scaling of extreme precipitation based on the C-C relationship is unlikely everywhere for at least 2 reasons:
  - Vertical uplift in convective storms may be enhanced because of increased latent heat release
  - Changes in frequency and/or intensity of weather systems that cause extreme precipitation may occur



# The Challenge

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# The Challenge

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- Durations (19)
  - 5 minutes up to 60 days
- Annual Exceedance Probabilities (10)
  - 63% down to 0.1%



## Where to turn for answers?

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- Climate Model Simulations are a prime source
- We would like lengthy (multi-decadal) simulations from multiple models for multiple future emissions pathways
  - High spatial resolution
  - Data storage at sub-hourly time resolution
- But, **we do not have this**

## **NOAA Atlas 15-Volume 2**

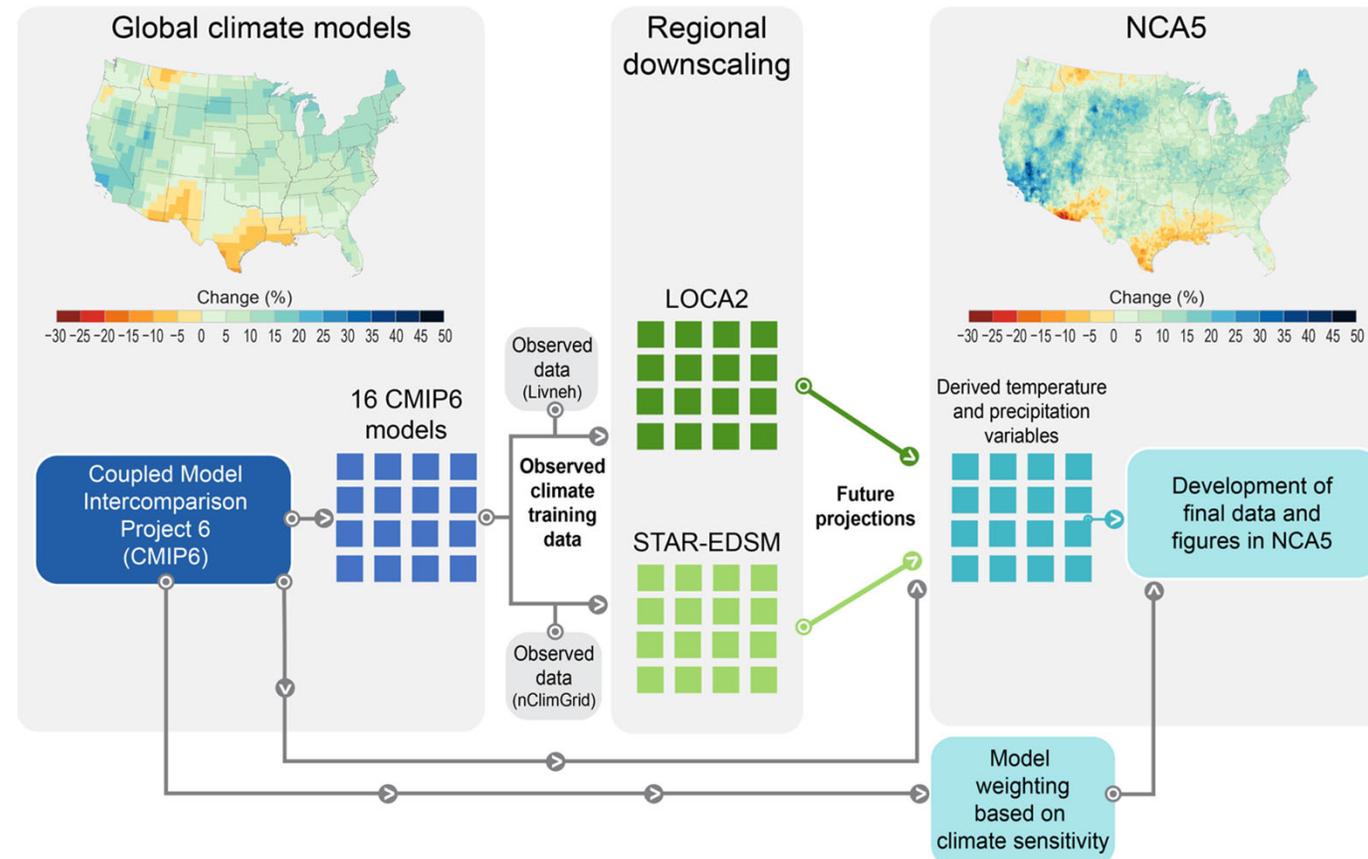
# **So, what do we have?**

# NA15-Vol.2 Science Tasks/Challenges

- Downscaled Climate Model Datasets (at this point in time)
  - LOCA2 (1/16<sup>th</sup> degree resolution)
  - STAR (1/24<sup>th</sup> degree resolution)
  - UWPD (1/10<sup>th</sup> degree resolution)

Used in 5<sup>th</sup> National Climate Assessment

Downscaling Global Climate Model Data for NCA5





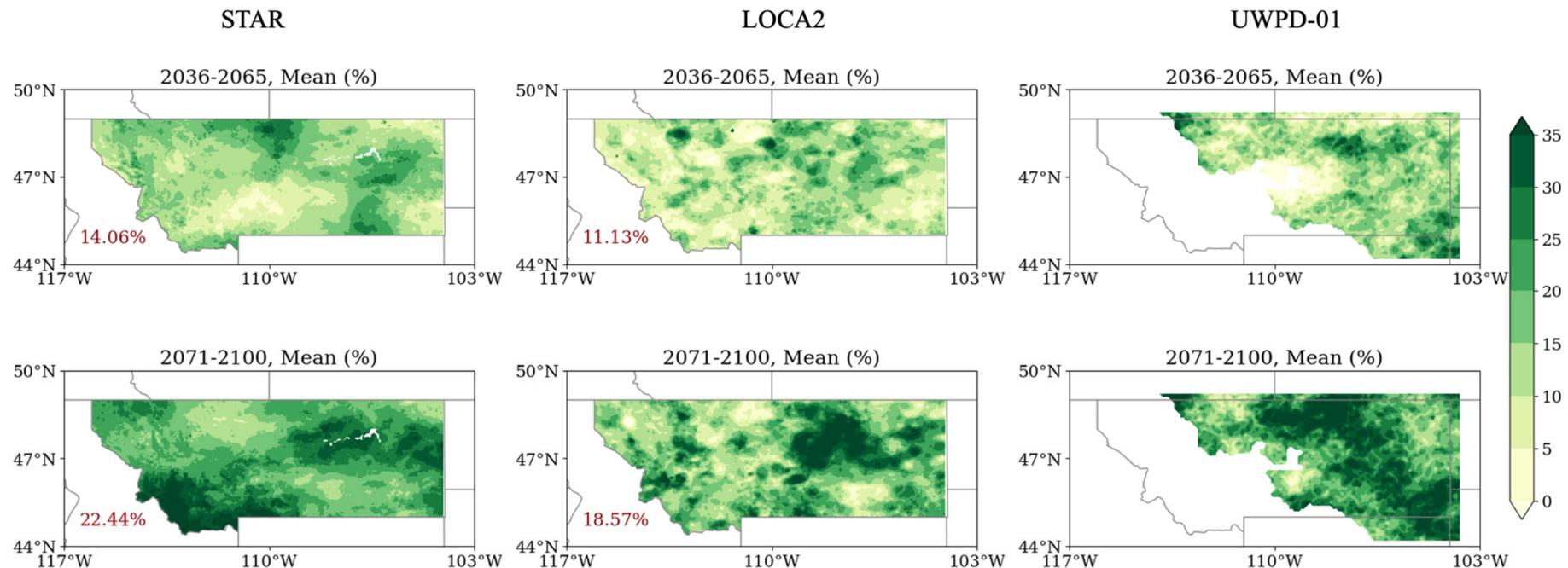
## NA15-Vol.2 Science Tasks/Challenges

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- Downscaled Climate Model Datasets
  - LOCA2, STAR, UWPD (daily precipitation)
  - Provides information for 24-hr and longer durations, maybe down to the 1-2% AEP range

# Preliminary Results of Downscaled Data Analysis

- Comparison of 5% AEP, daily values among the 3 downscaled datasets
- Overall changes are similar, but lots of spatial variability
- **Our conclusion:** Adjustment factors should be averaged over large areas and multiple models



*Estimated daily, 20-yr values under SSP5-8.5 for mid-Century (top) and end of Century (bottom)*



## NA15-Vol.2 Science Tasks/Challenges

---

- Downscaled Climate Model Datasets
  - LOCA2, STAR, UWPD (daily precipitation)
  - Provides information for 24-hr and longer durations, maybe down to the 1-2% AEP range
- Limitations
  - Statistically downscaled data typically available only at daily resolution
  - Limited CMIP6 data availability at sub-daily resolutions



**So, what about sub-daily durations?**



## NA15-Vol.2 Science Tasks/Challenges

---

- As duration shortens, localized convection may play a more important role in extreme events
- Convection-resolving Climate Models
  - Sidesteps uncertainties in cumulus parameterization schemes



## Sub-daily durations

---

- Convection-resolving Climate Models (CRCMs)
  - National Center for Atmospheric Research simulations (CONUS404)
    - 4 km spatial resolution, 15 min time resolution
    - Historical simulation (1979-2022) completed
    - Future simulation possibly available in spring 2024

Rasmussen, R.M., Chen, F., Liu, C.H., Ikeda, K., Prein, A., Kim, J., Schneider, T., Dai, A., Gochis, D., Dugger, A. and Zhang, Y., 2023. CONUS404: The NCAR-USGS 4-km Long-Term Regional Hydroclimate Reanalysis over the CONUS. *Bulletin of the American Meteorological Society*, 104(8), pp.E1382-E1408.

# Sub-daily durations

---

- Convection-resolving Climate Models (CRCMs)
  - Northern Illinois University
    - 3.75 km spatial resolution, 15-min time resolution
    - Historical and future 15-yr simulations

# Sub-daily durations

---

- Other model resources
  - NA-CORDEX
    - 25 km spatial resolution, 1-hr time resolution precip data
    - 1950s/1970s-2100



## Sub-daily durations

---

- Other high resolution simulations may become available during the project



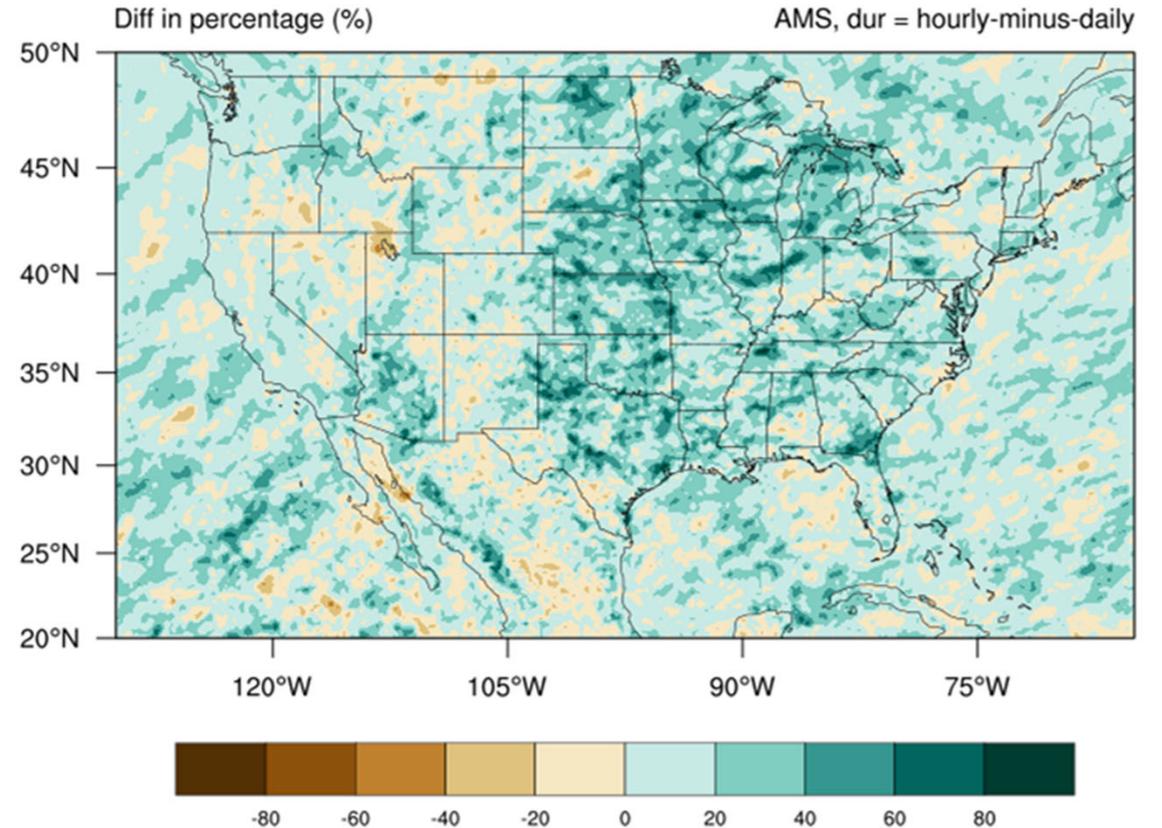
## Sub-daily durations

---

- Sub-daily climate model simulation data
  - Null hypothesis: the relative adjustment [(future-historical)/historical] is the same for durations from 5 minutes to 24-hr
  - Will the CRCM simulations provide robust evidence that this is not the case?

# Preliminary Results of NA-CORDEX hourly data

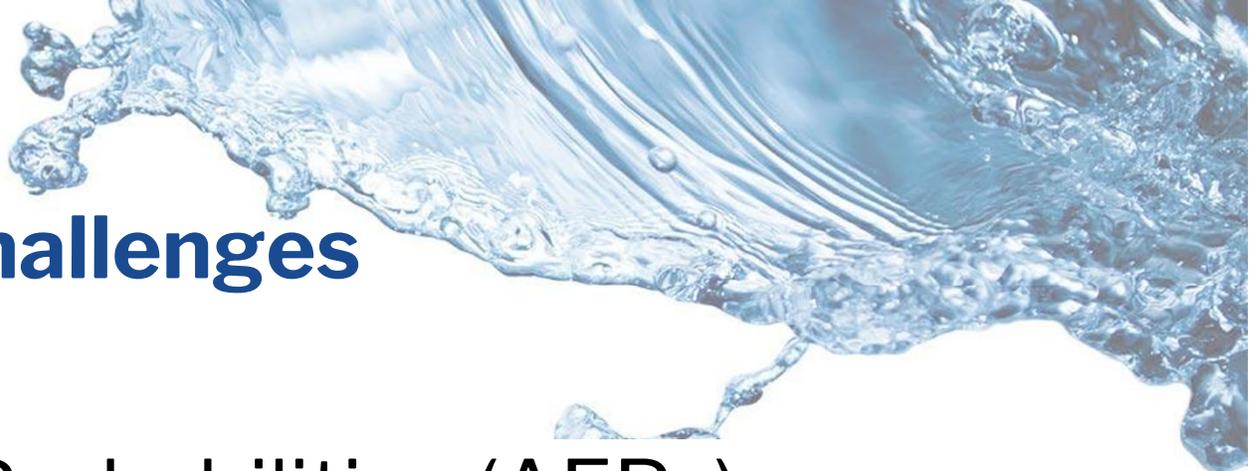
- Comparison of Annual Maximum Series (AMS) average values for late 21<sup>st</sup> Century relative to late 20<sup>th</sup> Century
- Hourly AMS minus 24-hr AMS
- **Our conclusion:** Adjustment factors for hourly duration may be higher than 24-yr over central U.S



*Difference (%) in average AMS between hourly and daily durations*



# What about small AEPs?



## NA15-Vol.2 Science Tasks/Challenges

---

- Small Annual Exceedance Probabilities (AEPs).
  - How to reliably estimate
    - With only about 100 years of high quality historical data
    - From future projections from single model simulations extending to 2100
- Pooling of climate model data one possible research approach

# Small AEPs

---

- Large single GCM ensembles
  - NOAA SPEAR
    - 50 km resolution
    - 30 members (1920-2100) completed
  - CESM LENS
    - ~100 km resolution
    - 40 members (1920-2100)



## Small AEPs

---

- CMIP6 multi-model ensembles
  - ~40 models with daily precipitation for historical and scenarioMIP experiments
  - Pooling of data is more challenging than with single model large ensembles

# Small AEPs

---

- Large ensembles analysis
  - Null hypothesis: the relative adjustment [(future-historical)/historical] is the same for AEPs from 2% down to 0.1%
  - Will the large ensemble simulations provide robust evidence that this is not the case?



# Questions?

---

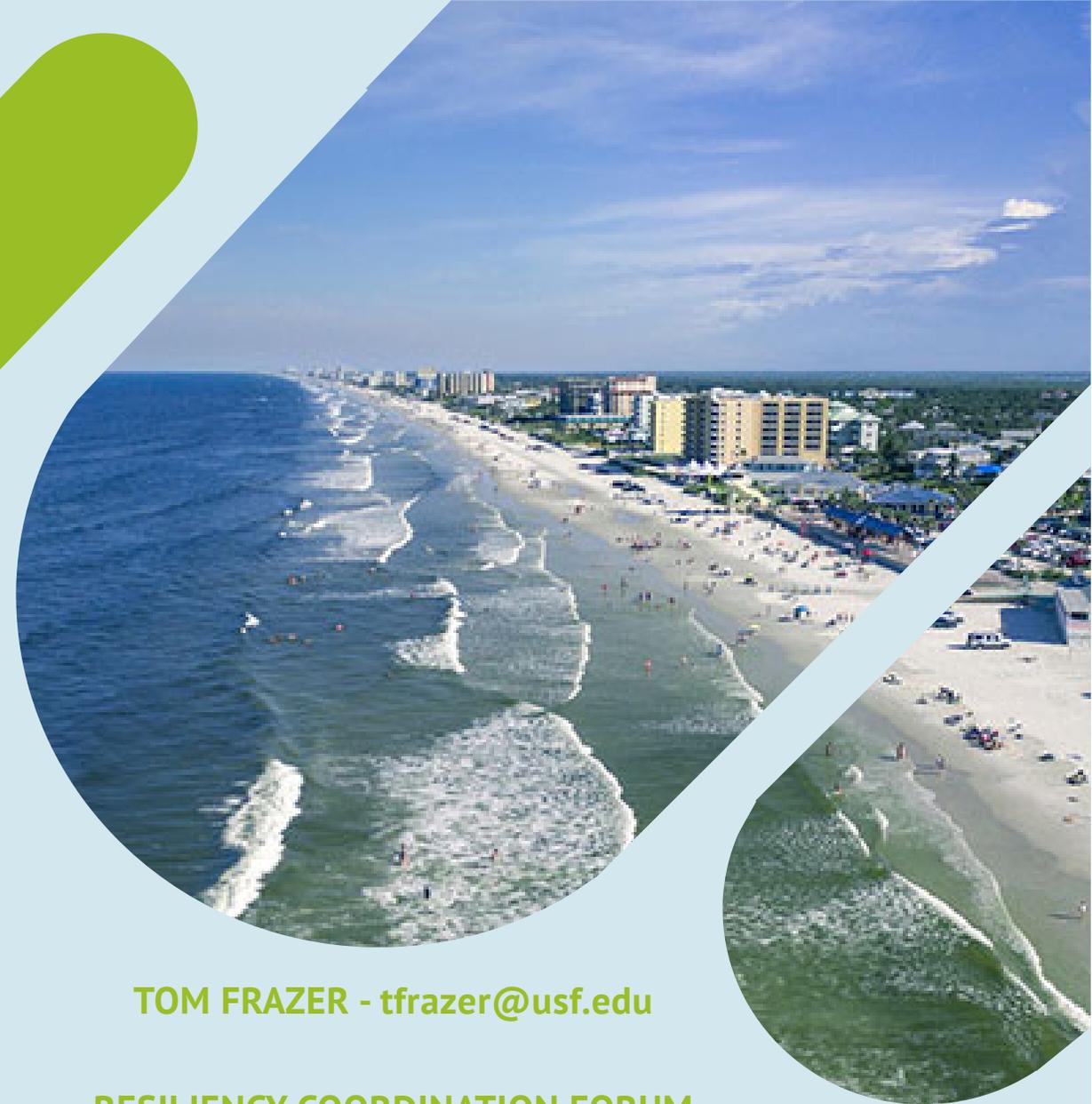
## Acknowledgements

- Technical assistance provided by Xia Sun and Liqiang Sun
- Funding for my effort on this project provided by NOAA through CIROH in cooperation with RTI



**UNIVERSITY OF  
SOUTH FLORIDA**  
College of MARINE SCIENCE

# Estimates of Sea Level Rise to Inform Resilience Planning in Florida



**TOM FRAZER - [tfrazer@usf.edu](mailto:tfrazer@usf.edu)**

**RESILIENCY COORDINATION FORUM**

**SFWMD – 28 FEBRUARY 2024**

# Florida Flood Hub

## OVERVIEW

Represents a first in Florida

Established by the State at the University of South Florida College of Marine Science

Focus on some of the state's most pressing environmental challenges

Improve flood forecasting and inform science-based policy, planning, and management

Bridge gaps among scientists, policymakers, practitioners, and the public to help communities mitigate and adapt to flooding

Inform resilience — the ability of communities to prepare for, withstand, and rebound from floods and other natural hazards



# Scientific and Technical Workgroups

WORKGROUPS ARE CENTRAL TO THE SUCCESS OF THE FLORIDA FLOOD HUB



Sea Level Rise Workgroup



Rainfall Workgroup



Comprehensive Modeling Workgroup

# Sea Level Rise Workgroup

## INITIAL PRODUCTS

Use data in the Federal Task Force report released in 2022

Focus on sea level rise as it affects Florida

Assess risk = Magnitude of impact × Likelihood of impact

Reunite the west and east coasts of Florida

Predict changes in sea level from a 2000 baseline

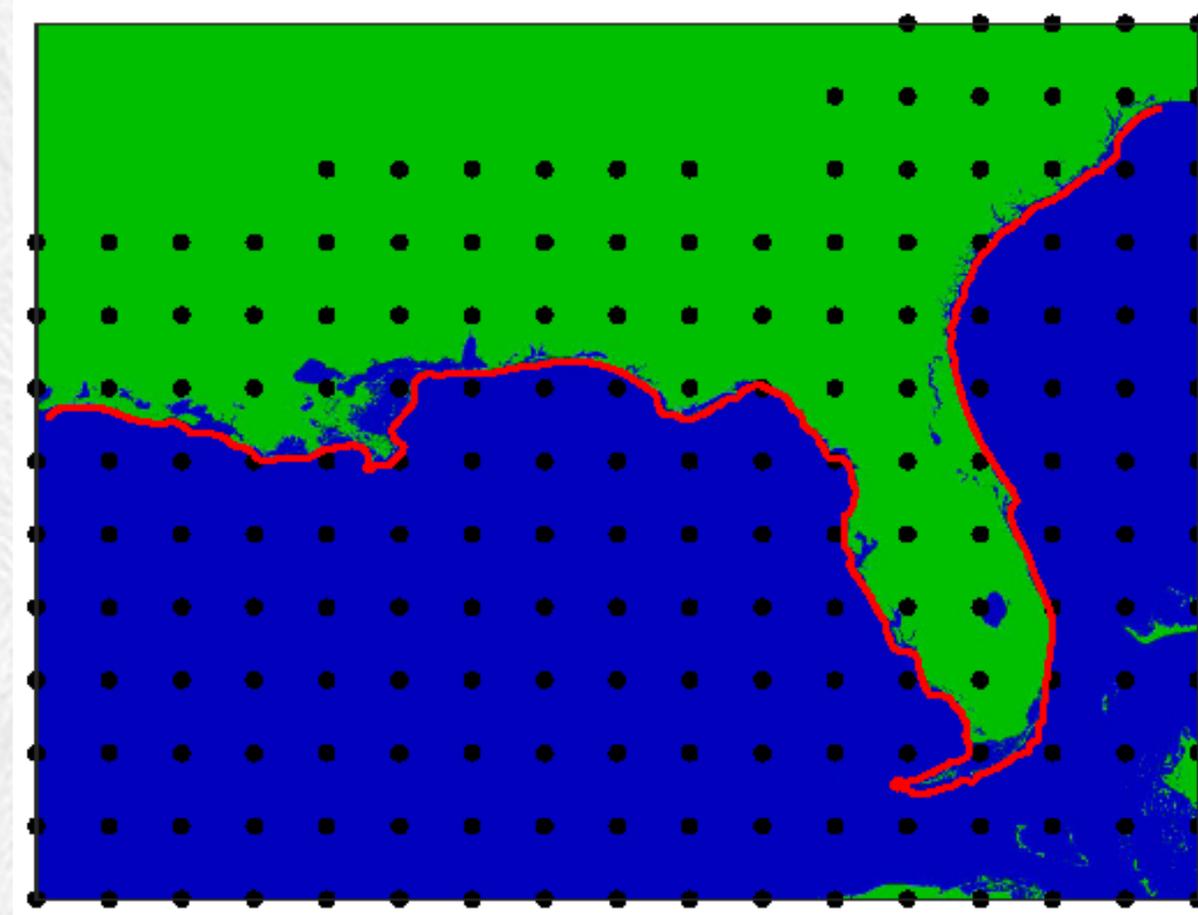
Focus on five changes in sea level by 2100

Report on four intermediate time horizons (2020, 2040, 2050, and 2070)

Document increases in sea level for time horizons (**magnitude for risk**)

Incorporate five likely increases in mean global surface air temperatures

Calculate the likelihood of exceeding increases (**likelihood for risk**)



# Sea Level Rise Scenarios for Florida

SEA LEVEL RISE WORKGROUP INITIAL PRODUCTS: **MAGNITUDE FOR RISK**

Table 1: Sea level change relative to 2000 for Florida across four time horizons

Global mean sea level rise scenario	Time horizon			
	2000 – 2020	2000 – 2040	2000 – 2050	2000 – 2070
	-----mm / inches-----			
Low	91 / 3.6	198 / 7.8	251 / 9.9	336 / 13.2
Intermediate low	100 / 3.9	227 / 8.9	293 / 11.5	428 / 16.9
Intermediate	103 / 4.1	245 / 9.6	333 / 13.1	554 / 21.8
Intermediate high	104 / 4.1	272 / 10.7	399 / 15.7	771 / 30.4
High	104 / 4.1	298 / 11.7	459 / 18.1	979 / 38.5

# Exceedance Probabilities

SEA LEVEL RISE WORKGROUP INITIAL PRODUCTS: **LIKELIHOOD FOR RISK**

Table 2: Exceedance probabilities for sea level rise scenarios projected to 2100

Global mean sea level rise scenario	Predicted increase in global mean surface air temperature				
	1.5°C	2.0°C	3.0°C	4.0°C	5.0°C
Low	92%	98%	>99%	>99%	>99%
Intermediate low	37%	50%	82%	97%	>99%
Intermediate	<1%	2%	5%	10%	23%
Intermediate high	<1%	<1%	<1%	1%	2%
High	<1%	<1%	<1%	<1%	<1%

# Exceedance Probabilities

SEA LEVEL RISE WORKGROUP INITIAL PRODUCTS: **LIKELIHOOD FOR RISK**

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<b>Intermediate</b>	<1%	2%	<b>5%</b>	10%	23%
Intermediate high	<1%	<1%	<1%	1%	2%
High	<1%	<1%	<1%	<1%	<1%

# Sea Level Rise Scenarios for Florida

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Intermediate high	104 / 4.1	272 / 10.7	399 / 15.7	771 / 30.4
High	104 / 4.1	298 / 11.7	459 / 18.1	979 / 38.5

# Sea Level Rise Scenarios for Florida

POTENTIAL APPLICATION: COMBINE LIKELY RISK WITH PLANNING HORIZON TO INFORM RESILIENT APPROACHES

Table 1: Sea level change relative to 2000 for Florida across four time horizons

Global mean sea level rise scenario	Time horizon			
	2000 – 2020	2000 – 2040	2000 – 2050	2000 – 2070
	-----mm / inches-----			
Low	91 / 3.6	198 / 7.8	251 / 9.9	336 / 13.2
<b>Intermediate low</b>	<b>100 / 3.9</b>	<b>227 / 8.9</b>	<b>293 / 11.5</b>	<b>428 / 16.9</b>
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Intermediate high	104 / 4.1	272 / 10.7	399 / 15.7	771 / 30.4
High	104 / 4.1	298 / 11.7	459 / 18.1	979 / 38.5

## Examples:

- Transportation (roads and bridges)
- Energy systems (replacement and upgrades)
- Stormwater systems (improved design)
- Shoreline protection (green and gray)
- Other critical assets

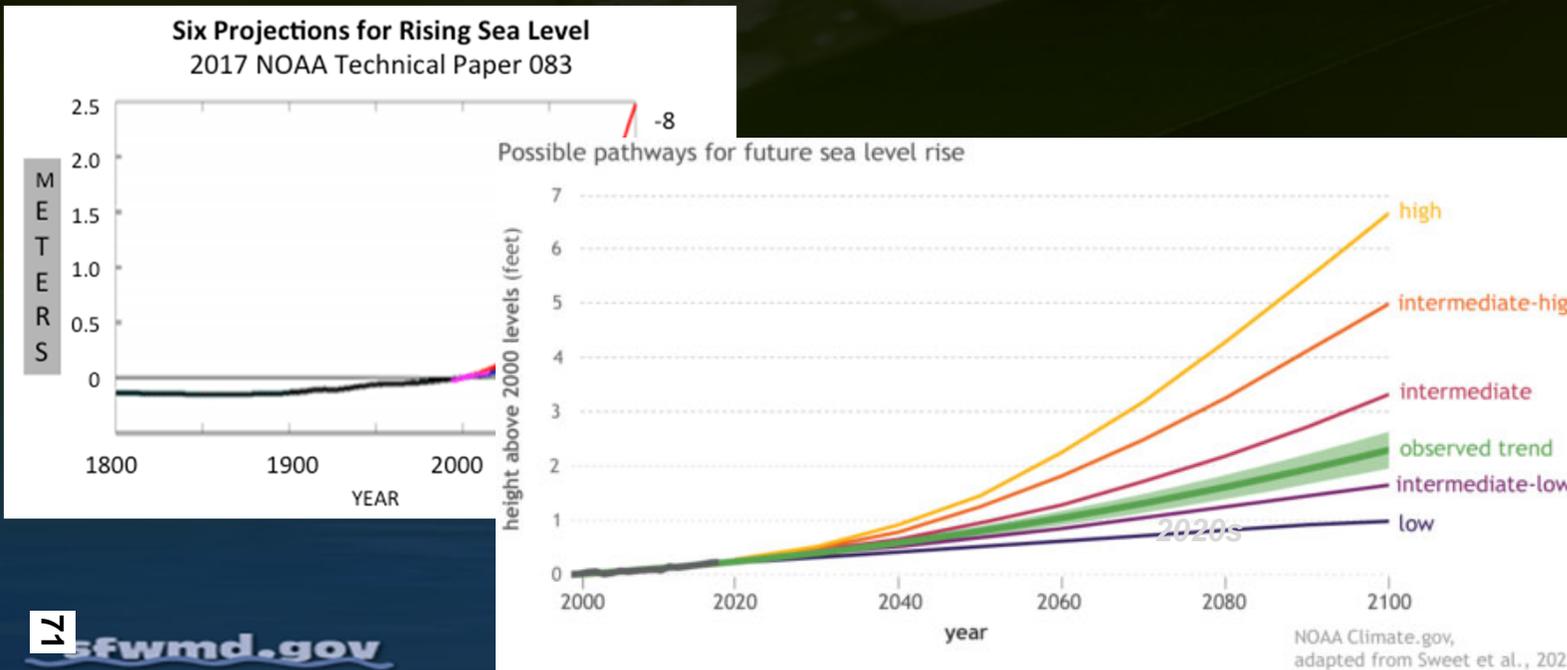
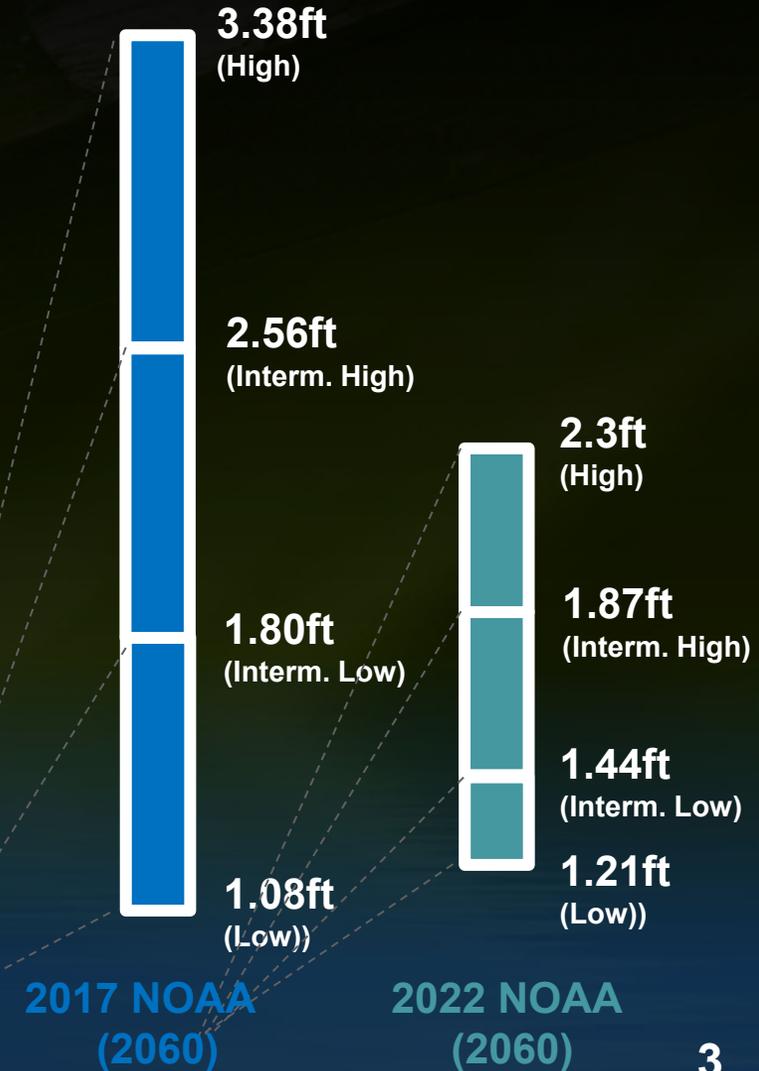
# Next steps

## SEA LEVEL RISE WORKGROUP

- Link exceedance probabilities to specific emission pathways and time horizons
- Look at the frequency of occurrence of high tide flooding and weather events
- Do a careful quality control and analyses of the regional tide gauge time series
- Explore possible contributions by regional ocean processes

# SLR Projections – Reducing Uncertainty

NOAA Curve/SLR (ft)	2017 (2040)	2022 (2040)	2017 (2060)	2022 (2060)	2017 (2080)	2022 (2080)
Intermediate Low	0.69	0.36	1.08	1.21	1.44	1.67
Intermediate	1.05	0.82	1.80	1.44	2.72	2.36
Intermediate High	1.41	0.92	2.56	1.87	4.10	3.38
High	1.77	1.02	3.38	2.30	5.61	4.46



# Questions?

**TOM FRAZER**  
**[tfrazer@usf.edu](mailto:tfrazer@usf.edu)**





# SFWMD RESILIENCY COORDINATION FORUM: C&SF FLOOD RESILIENCY STUDY AND SE FLORIDA PROJECT INTEGRATION UPDATE

28 February 2024

E. Timothy Gysan, P.E.,PMP  
Resilience Sr Project Manager  
Jacksonville District  
U.S. Army Corps of Engineers

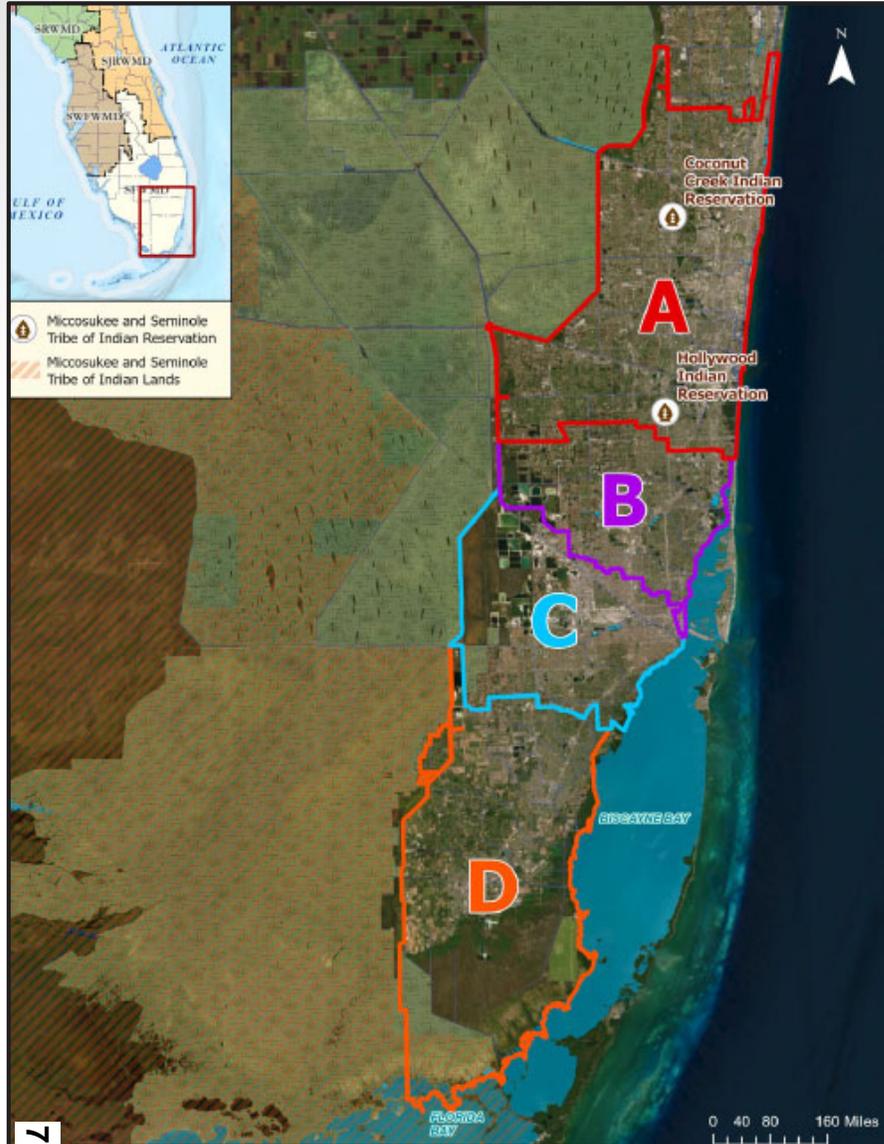


US Army Corps  
of Engineers



U.S. ARMY

# SOUTH FLORIDA ECOSYSTEM RESTORATION AND C&SF RESILIENCE PROGRAMS | PLANNING C&SF FLOOD RESILIENCY (SECTION 216) STUDY



## STUDY PURPOSE:

- Enhance existing C&SF water control system functionality and capacity to improve flood risk management and resiliency which has been degraded by inland inundation and changed conditions within southern Palm Beach, Broward and Miami Dade Counties

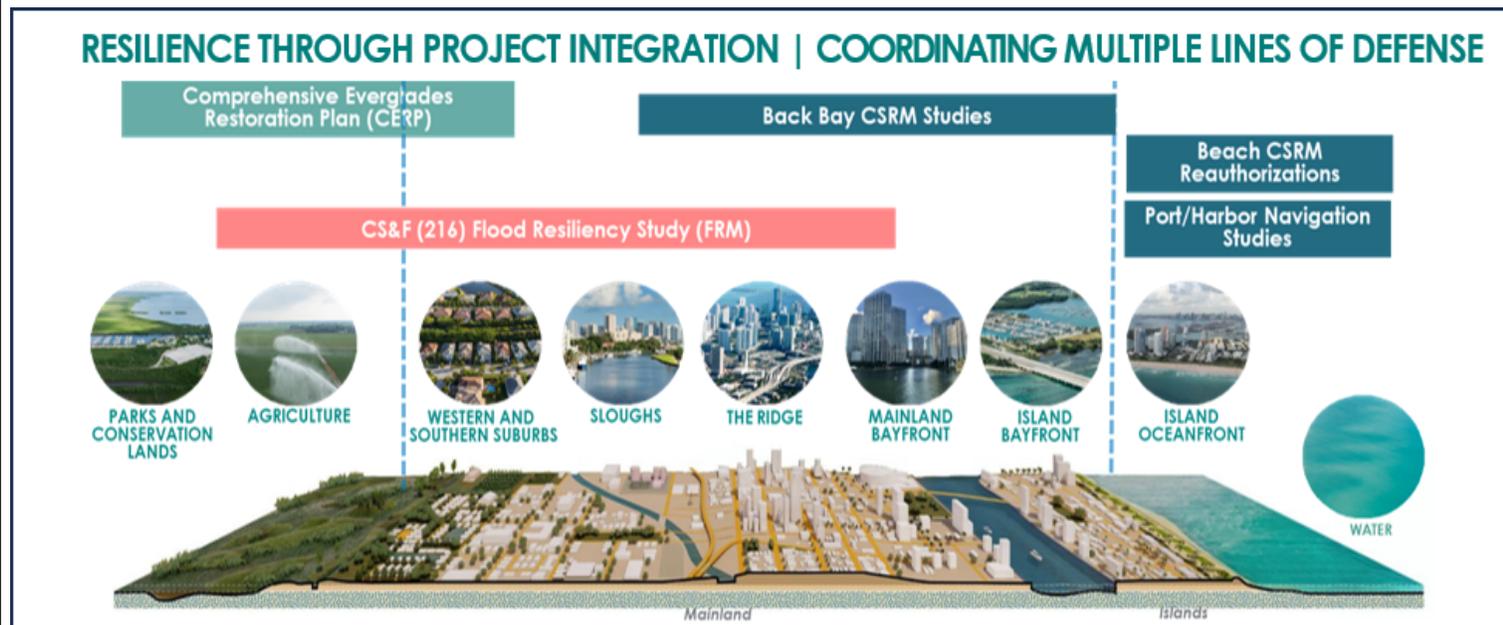
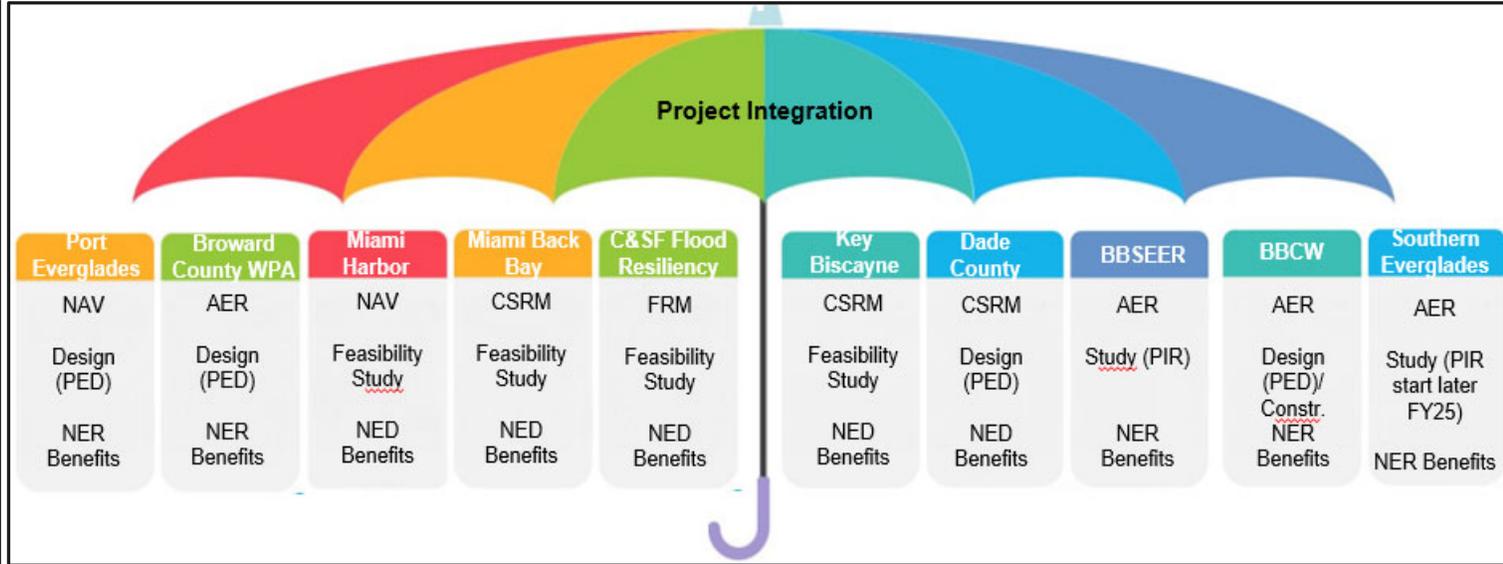
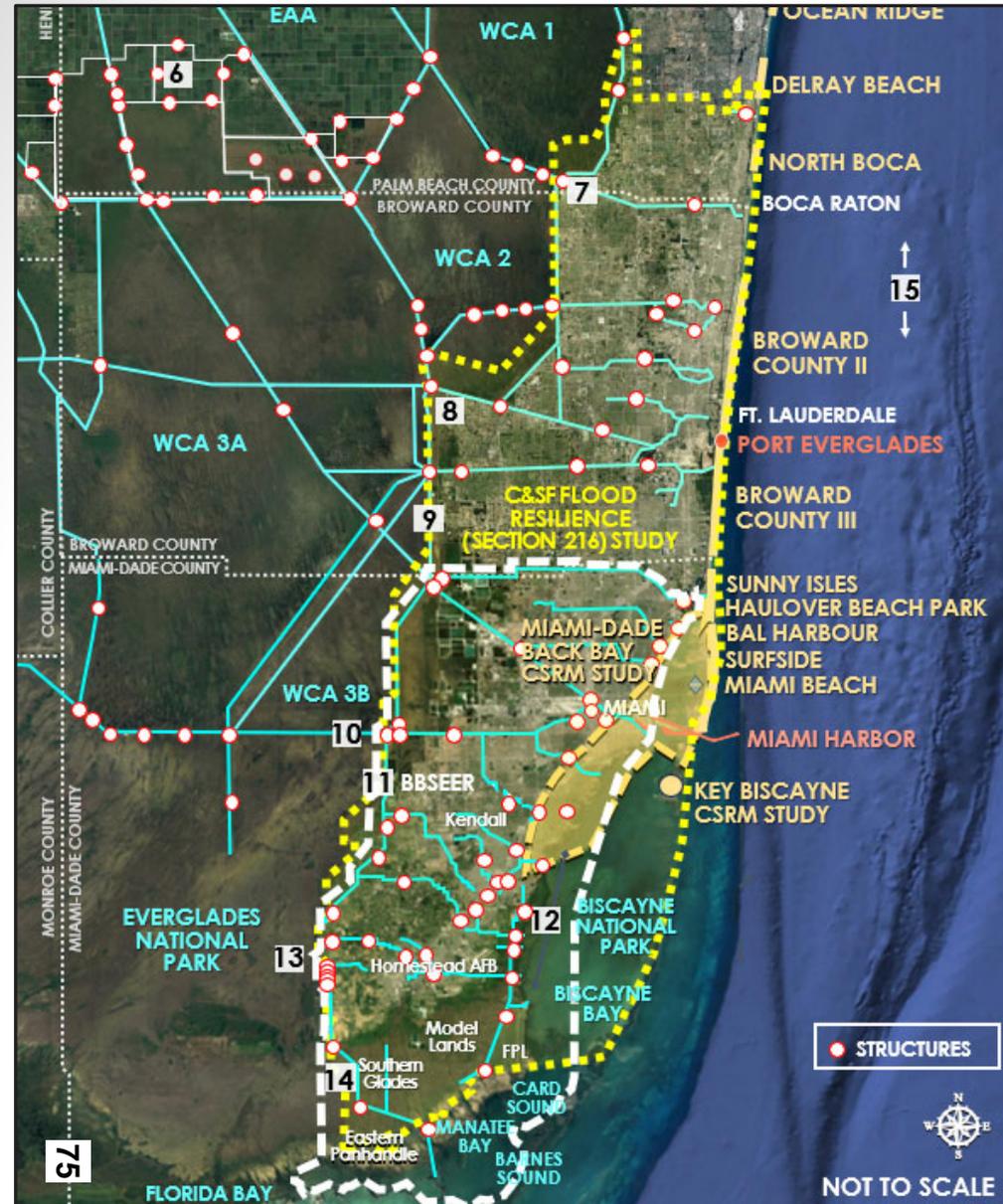
## STATUS:

- VTAM briefing with MG Graham January 8, 2024
  - Application of June 5, 2023 guidance on ER 1110-2-1302 (engineering design maturity to support Class 3 cost estimate) lead to increased study cost;
  - HQUSACE did not approve current scope;
- Path forward
  - SAJ-SFWMD team will complete future without project modeling and evaluations by May 2024
  - SAJ-SFWMD team will work with stakeholders to determine prioritization for ~4 locations to carry forward for Class 3 cost and develop recommendation to advance remaining locations
  - Revised VTAM to be submitted summer 2024
- Public Engagement
  - 22 JAN 2024 – SFRPC meeting – council endorsed Broward and Dade counties support of design efforts
  - 7-8 MAR 2024 - Virtual Project Delivery Team Public Workshop performance metrics



U.S. ARMY

# SOUTH FLORIDA ECOSYSTEM RESTORATION AND C&SF RESILIENCE PROGRAMS | PLANNING SE FLORIDA PROJECT INTEGRATION



# WE ARE HIRING!

## Join the Jacksonville District Team

**Seeking to fill multiple positions:**

Biologist, Physical Scientist, Program Analyst, Engineers, Geologist, Chemist, Landscape Architect and many more.

Scan the QR Code



Or visit

[www.saj.usace.army.mil/NowHiring](http://www.saj.usace.army.mil/NowHiring)



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US Army Corps  
of Engineers®



# 2024 Wet Season Flood Information Resources

**Christine Carlson, Geospatial Architect, South Florida Water Management District**

**Mike Bennett, Head of North America Government Solutions, ICEYE**

**Mark Antonik, Strategic Account Manager, ICEYE; and**

**Jin Lee, Client Success Manager, ICEYE**

**Julia Kumari Drapkin, CEO and Founder, ISeeChange**

## Today's Agenda Item

- 9A. South Florida Flood Information Resource, Tools and Training
- 9B. ICEYE's Flood Insights for Florida
- 9C. ISeeChange Flood Tracking in the City of Miami Dade and Miami-Dade County

# 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).



**SURVEY 123**

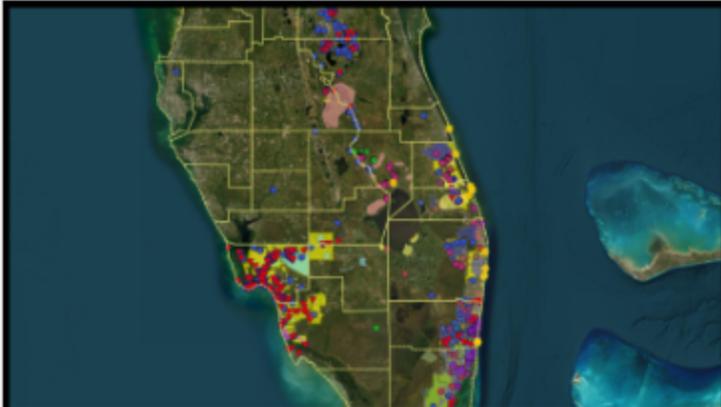
[Document the Floods](#)

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

[Submit / Capture Photo](#)

# Public Flood Information Viewer

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



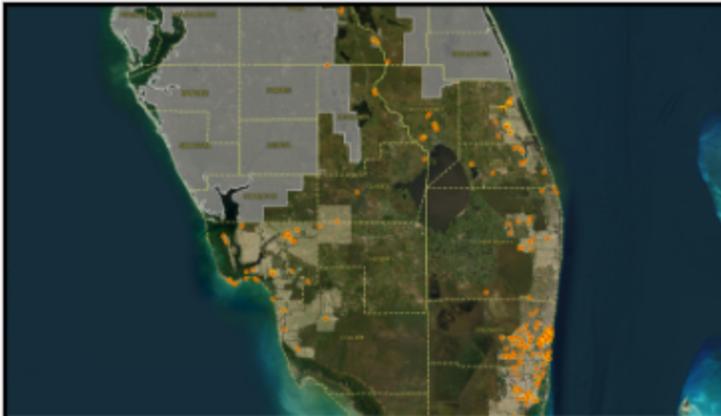
**Flood Information Viewer**

## South Florida Flood Information Viewer

Web Application to provide access to the first version of flood documentation compiled as part of the SFWMD Water and Climate Resilience Flood Metric.

# 2024 Wet Season 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

- Notification with instructions will be sent for account registration
- Local government staff can gain access to secured content after agreeing to comply with our data access and use agreement
- Agreement is required to honor data access and use licensing agreements SFWMD has with vendors like ICEYE
- In 2024, local government staff will have access to
  - SFWMD High Water Mark Survey (Silver Jacket Derived)
  - “Private” flood reports in areas with restricted sharing policies
  - Flood Repository Application providing access to review and download compiled data

# 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.

# High Water Mark / Flood Observation Training Opportunities

- Training is open to Local Government Staff
- Sign Up is through Microsoft Form
- First Come First Serve
- Training Locations, Dates, and Times
  - West Palm Beach Field Station – Tuesday, April 2, 9:30 – 12:30
  - Big Cypress Basin Field Station – Tuesday, April 9, 9:30 – 12:30
  - Clewiston Field Station – Thursday, April 11, 9:30 – 12:30
  - Fort Lauderdale Field Station – Wednesday, April 17, 9:30 – 12:30
  - Homestead Field Station – Tuesday, April 23, 9:30 – 12:30
  - Miami Field Station – Wednesday, April 3, 9:30 – 12:30
  - Okeechobee Field Station – Wednesday, April 24, 9:30 – 12:30
  - St. Cloud Field Station – Thursday, April 18, 9:30 – 12:30



# 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 screenshot displays a web-based map interface for the South Florida Water Management District. The main map area shows a satellite-style view of South Florida with numerous orange circular markers representing flood reports. The map includes several layers: Flood Reports / Observations (orange dots), Flood Prone Areas (1991-2022) (shaded regions), County Boundaries (dashed lines), and Water Management District Boundaries (dashed lines). A legend on the left side of the map lists the WMD names: NFWMD, SFWMD, SJRWMD, SRWMD, and SWFWMD. The interface includes a search bar, navigation tools (home, layers, full screen, print), a scale bar (30 mi), and a zoom control. The bottom navigation bar contains buttons for Photo Viewer, Current Event Viewer (selected), Flood Observation Summary, Social Media Summary, High Water Mark, Flood Prone Areas, and Event Summary. The footer text reads 'Earthstar Geographics | SFWMD Geospatial Services | NAVTEQ, SFWMD Geospatial Services' and 'Powered by Esri'.

# Flood Observation Viewer

### Filter by Year and Event

Year  
2023

Event Name  
Extreme Rain Event November 2023

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

**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:	

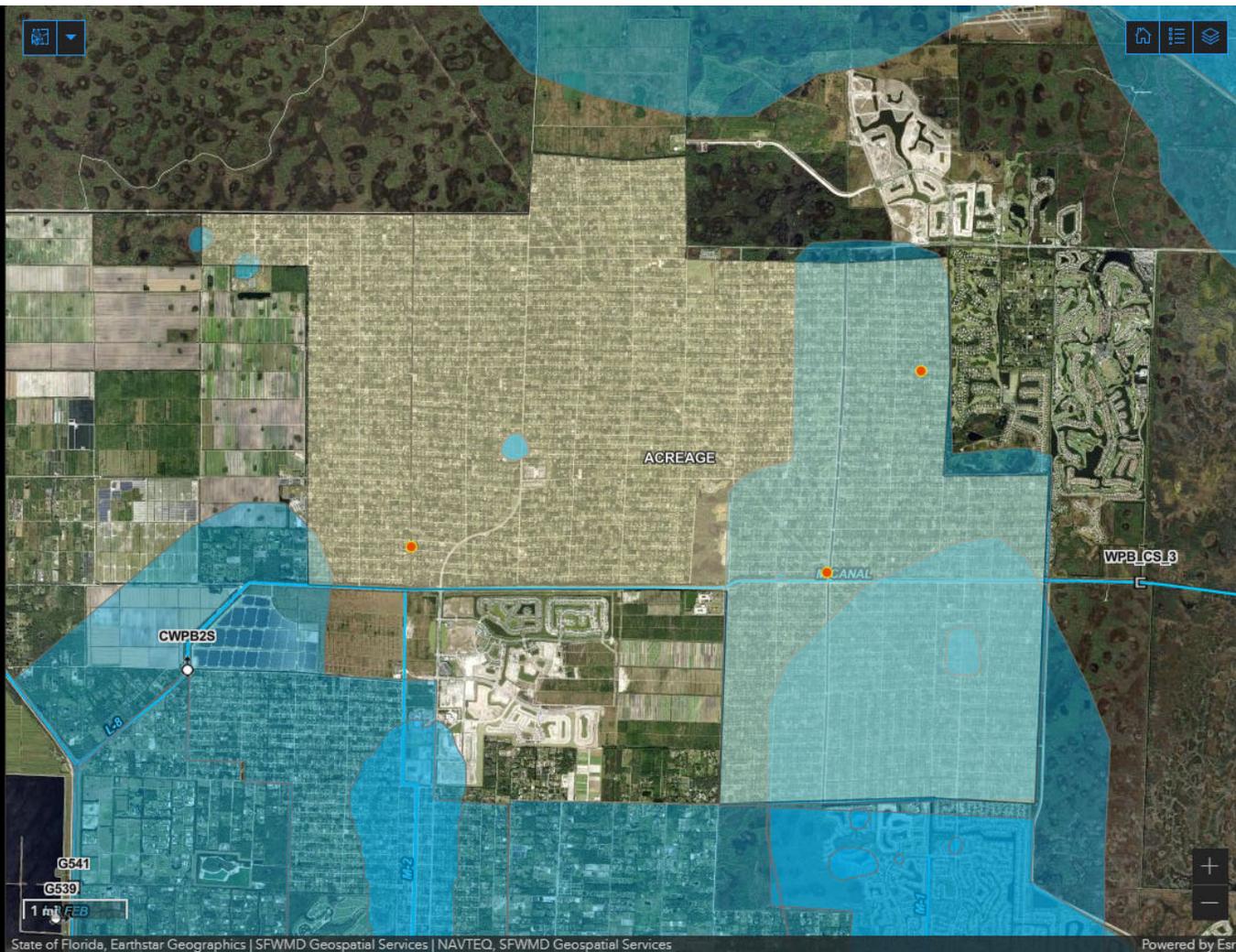
Photo Viewer
Current Event Viewer
Flood Observation Summary
Social Media Summary
High Water Mark
Flood Prone Areas
Event Summary



# Flood Prone Area Event Summaries

## 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

Current Event Viewer

Flood Observation Summary

Social Media Summary

High Water Mark

Flood Prone Areas

Event Summary

## Flood Extent within a Flood Prone Area



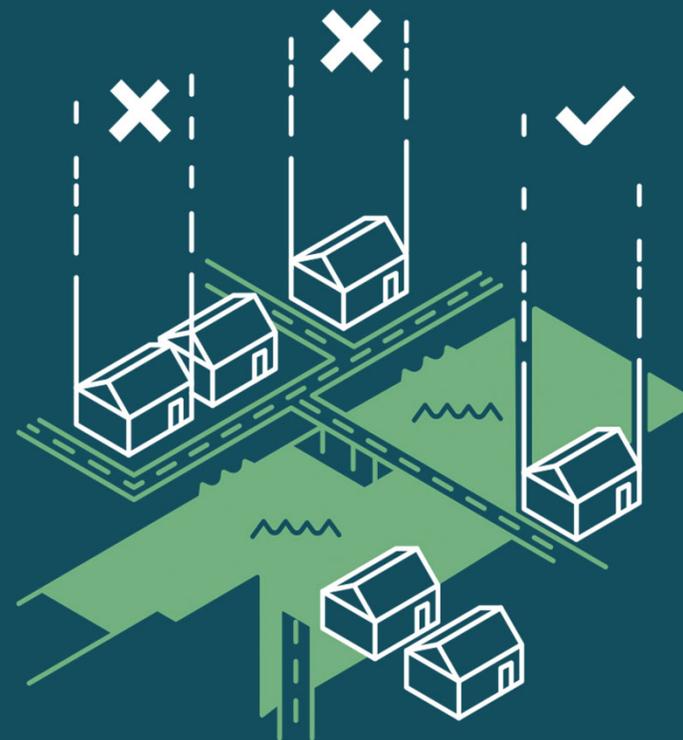
- Flood prone areas are being identified to
  - Evaluate monitoring gaps
  - Identify priorities for flood sensors deployment
  - Prioritize satellite / radar image acquisition
- Long-term objective is to identify the location and extent of recurrent flooding within flood prone areas using
  - High water marks
  - Satellite/radar imagery
  - Water level and flood sensor data
- Flood extents are being compiled for
  - SFWMD Resilience flood metric
  - Flood Protection Level of Service (FPLOS) model validation
  - Mitigation planning

# 9B. Flood Insights for Florida

**Mike Bennett, Head of North America Government Solutions, ICEYE;  
Mark Antonik, Strategic Account Manager, ICEYE; and  
Jin Lee, Client Success Manager, ICEYE**



# ACTIONABLE DISASTER INTELLIGENCE TO TRANSFORM GOVERNMENT RESPONSE, RECOVERY, MITIGATION & RESILIENCE



# UNMATCHED PERSISTENT MONITORING CAPABILITIES WITH THE WORLD'S LARGEST SAR CONSTELLATION

2014

ICEYE  
LAUNCHED

HEADQUARTERS IN FINLAND  
US HEADQUARTERS IN  
CALIFORNIA

PRESENCE IN:  
POLAND, SPAIN, JAPAN,  
LUXEMBOURG, & UK

650+

PEOPLE WITH  
60+ NATIONALITIES

WORLD LEADER  
IN NATURAL DISASTER  
MONITORING  
&  
SYNTHETIC APERTURE RADAR  
(SAR) MINIATURIZATION  
TECHNOLOGY

150+

FLOODS MAPPED GLOBALLY  
IN 25 COUNTRIES

50+

FLOODS MAPPED IN THE  
USA

1st SATELLITE LAUNCHED:  
2018  
31st SATELLITE LAUNCHED:  
Nov 2023



RADAR IMAGING

**THROUGH CLOUDS  
THROUGH DARKNESS  
THROUGH SMOKE  
THROUGH RAIN & WIND**

---

# ICEYE Constellation

## About the Fleet

More than 30 satellites launched since 2018, with more launched every year

## South Florida Capacity:

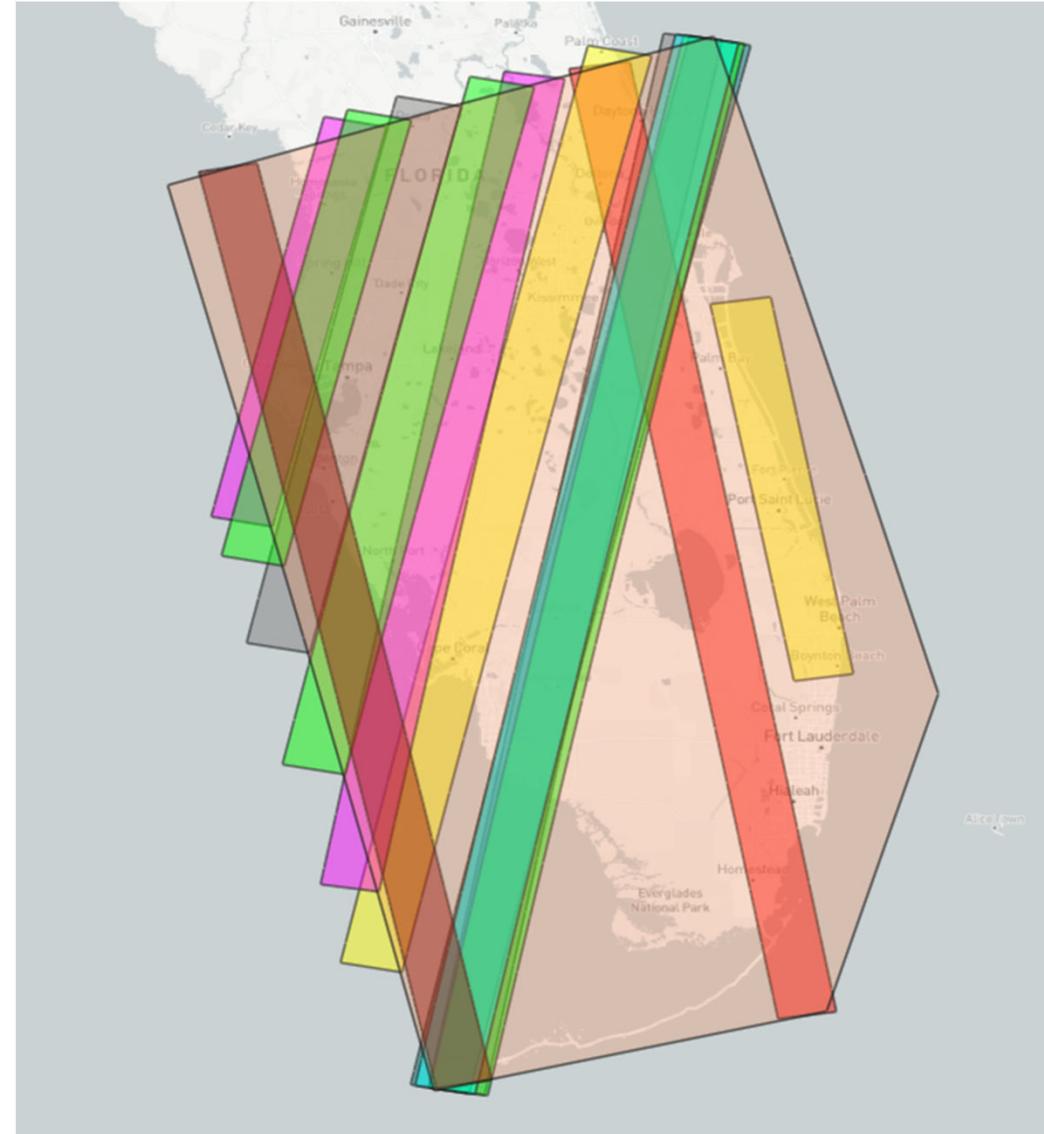
### Passes Per Day:

10-12 passes; up to 20 on a limited basis

### Revisit Time:

3-4 hours

*(Exact time between revisits will vary based on exact location and satellite orbits)*

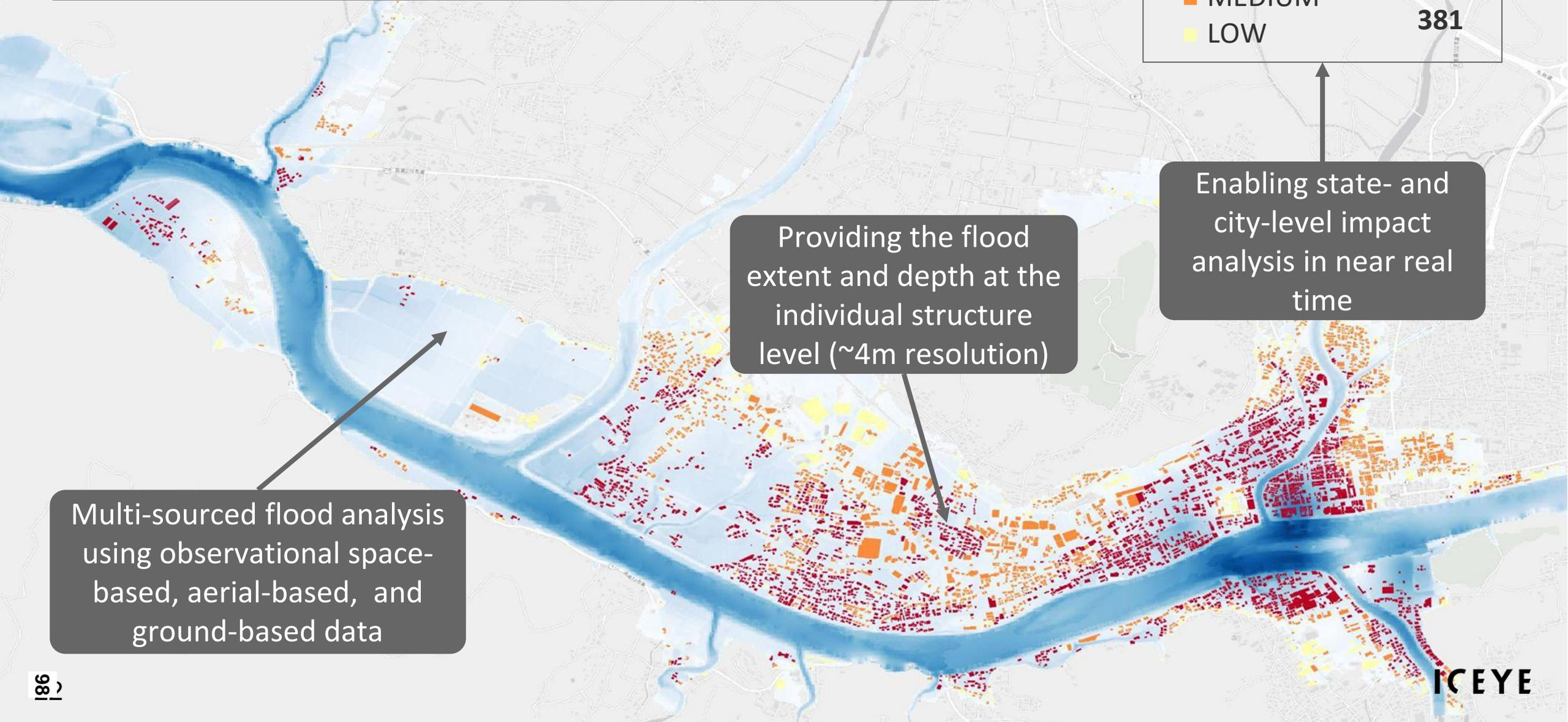


# Flood Insights

## UNIQUE FLOOD INSIGHTS FROM SPACE



# Flood Insights: Depth & Extent



■ HIGH	3085
■ MEDIUM	2132
■ LOW	381

Providing the flood extent and depth at the individual structure level (~4m resolution)

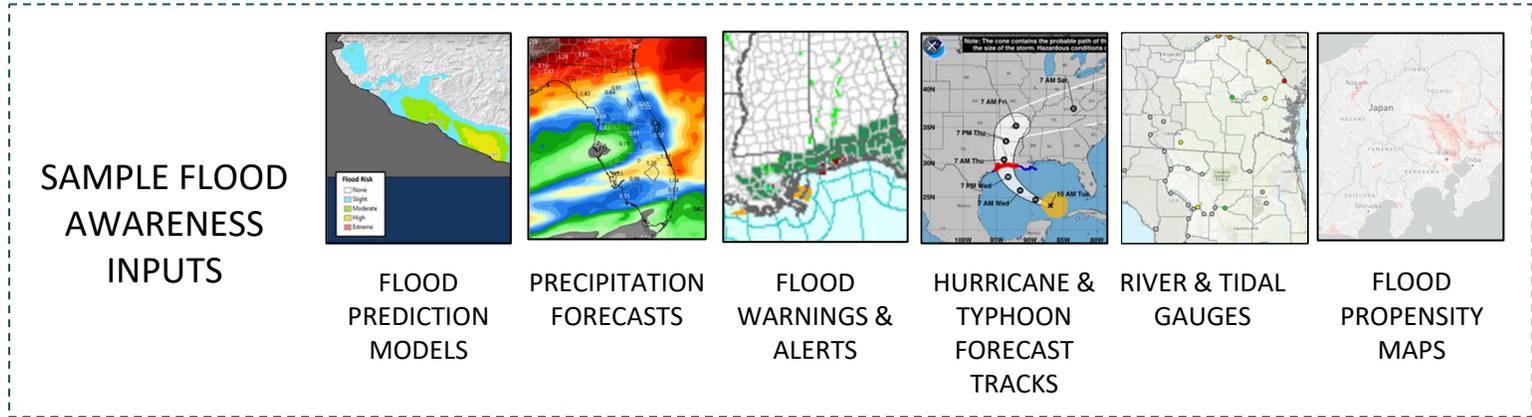
Enabling state- and city-level impact analysis in near real time

Multi-sourced flood analysis using observational space-based, aerial-based, and ground-based data

# BEST IN CLASS GLOBAL 3-DAY FLOOD TARGETING



Multiple teams chaired by meteorologists meet **four times daily** for potential flood event review and satellite targeting



## OBSERVED FLOOD EVENT IMPACT

**ICEYE Observed Flood Event Impact**

ICEYE aims to produce an analysis for every flood event in Priority 1 markets that meets ICEYE's analysis threshold (see below for threshold definitions). Events on this page are either being actively monitored or undergoing an analysis.  
If you have questions about an event we are monitoring please send a message to the following address: [floodactivation@iceye.com](mailto:floodactivation@iceye.com)

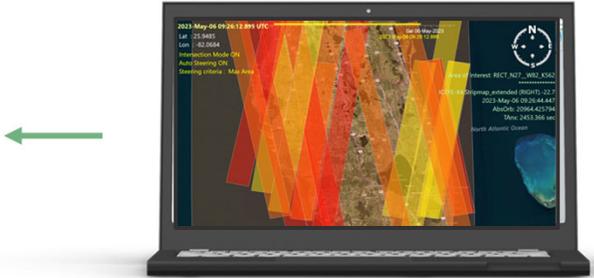
Country	Area of Interest	Event	Estimated Peak Start Date	Estimated Peak End Date	Market Priority <sup>1</sup>	Flooding Observed	ICEYE's Analysis Threshold <sup>2</sup>	Analyzed Population Centers
Australia	Victoria (FSD-1316)	Heavy Precipitation	23-Oct	26-Oct	1	YES	YES	Moama, Shepparton, Lilydale, Springvale, Wandin North, Tecoma, Kerang, Mooroolbark
Australia	Victoria, Tasmania (FSD-1299)	Heavy Precipitation	12-Oct	14-Oct	1	YES	YES	Future releases pending completion of FSD-1312 & FSD-1316
Australia	New South Wales, Queensland (FSD-1312)	Heavy Precipitation	19-Oct	24-Oct	1	YES	YES	Future releases pending completion of FSD-1299 & FSD-1316
Ghana	Greater Accra Region (FSD-1294)	Heavy Precipitation	5-Oct	7-Oct	2	YES	YES	Analysis on hold
Philippines	Mindanao, Visayas, Luzon (FSD-1319)	Tropical Storm Paeng	27-Oct	31-Oct	2	YES	NO	-

**ICEYE Forecasted Flood Event Impact<sup>1</sup>**

(Note: if you are aware of a flood that is not listed and would like ICEYE to take action please send us an email to the following address with a brief description of the location and event. [floodactivation@iceye.com](mailto:floodactivation@iceye.com))

Event	Estimated Peak Start Date	Estimated Peak End Date	Market Score	Population Score	Severity Score	Confidence Score	Forecasted Flood Score	Number of Planned Acquisition	FORECASTED LEVEL OF IMPACT:		
									LOW	MEDIUM	HIGH
Heavy Precipitation	19-Oct	24-Oct	3	2	1	2	2	-	1-2	2.1-2.5	2.6-3
Heavy Precipitation	16-Oct	17-Oct	2	3	3	1	2.4	17	1-2	2.1-2.5	2.6-3
Heavy Precipitation	18-Oct	19-Oct	2	3	1	2	1.7	6	1-2	2.1-2.5	2.6-3
Heavy Precipitation	16-Oct	18-Oct	1	3	1	2	1.3	4	1-2	2.1-2.5	2.6-3
Heavy Precipitation	17-Oct	19-Oct	2	3	2	2	2.1	10	1-2	2.1-2.5	2.6-3
Heavy Precipitation	16-Oct	19-Oct	2	3	1	2	1.7	13	1-2	2.1-2.5	2.6-3

## FORECASTED FLOOD EVENT IMPACT

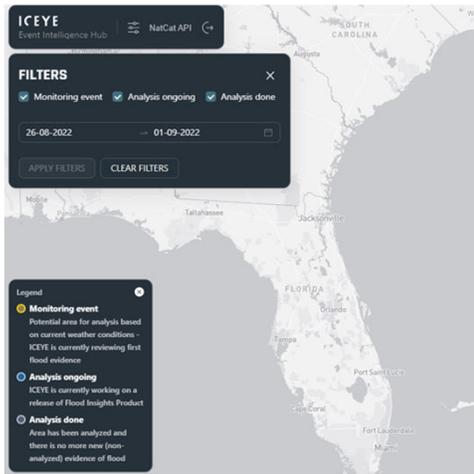


## FLOOD TARGETING WITH ICEYE SAR SATELLITE SWATHS

## DAILY FLOOD EVENTS REPORT

# HOW IS ICEYE'S FLOOD INSIGHTS PRODUCT CREATED?

**MONITOR**  
Potential  
flooding globally



**COLLECT**  
SAR + auxiliary  
flood data

SAR imagery

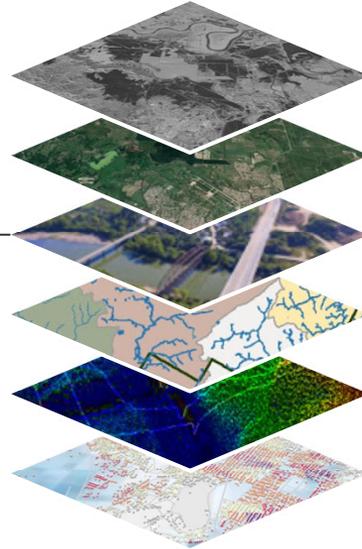


+

Geolocated Flood Evidence

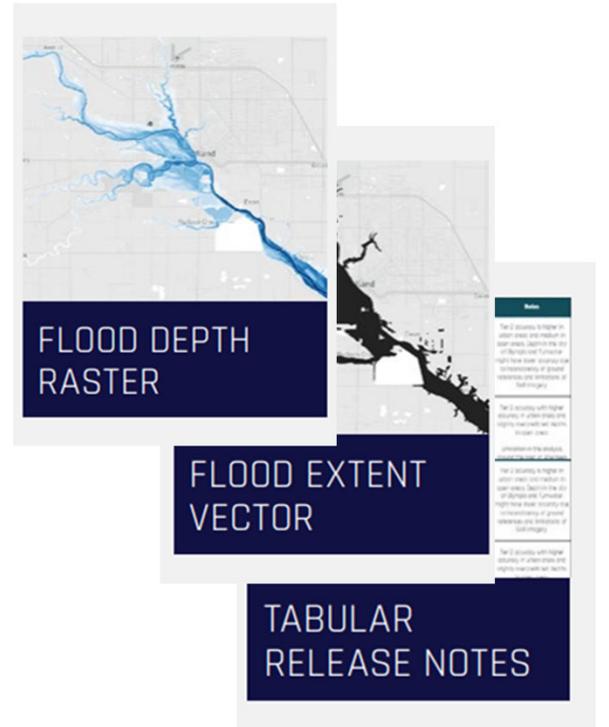


**ANALYZE**  
Multi-Source  
Insights



SFWMD Observation Data

**DELIVER**  
Flood Insights to  
customers



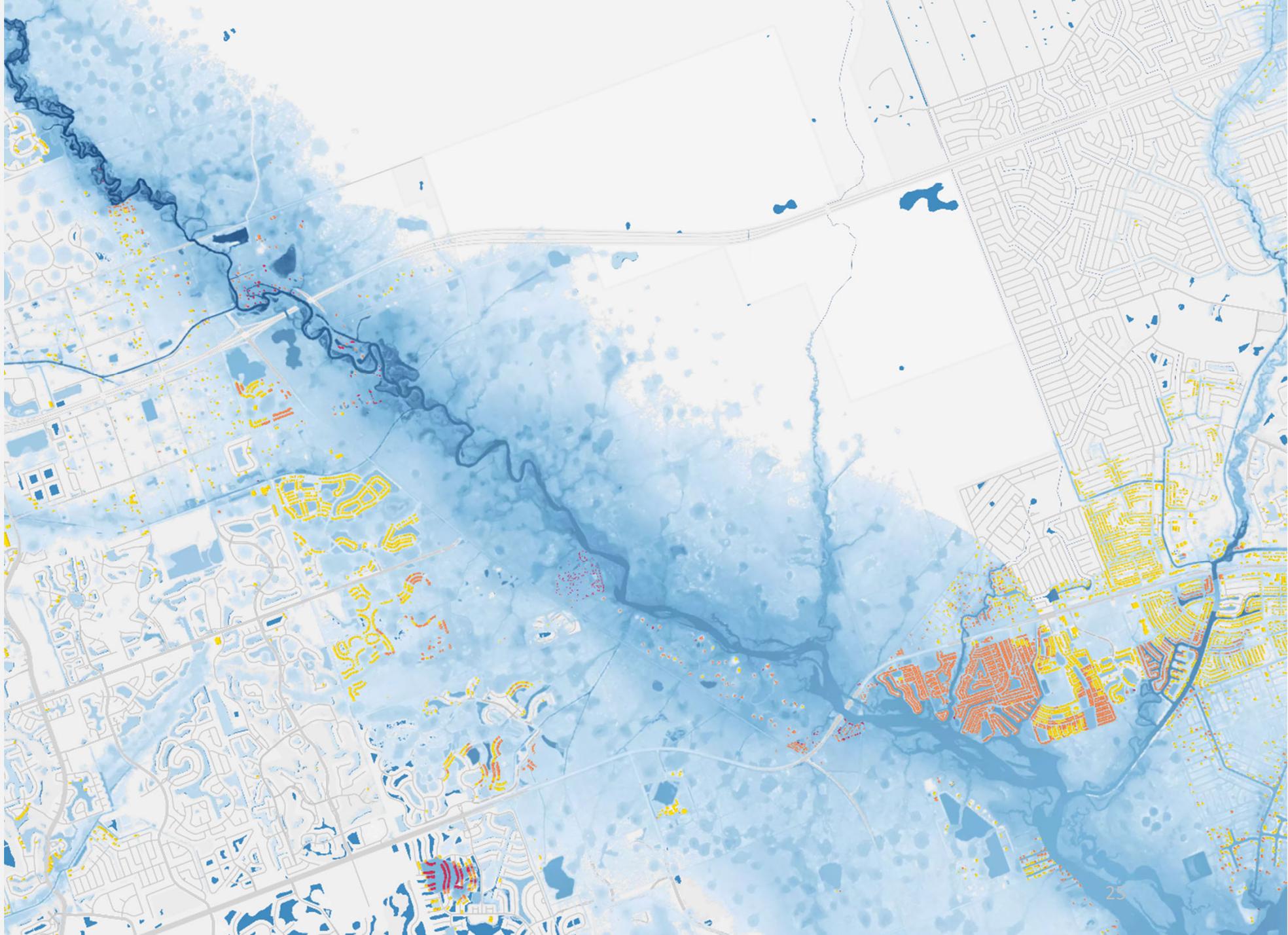
**ICEYE**

# Flooding From Hurricane Ian in Florida, US

- 1,937 mi<sup>2</sup> total flood extent.
- 1,32 ft average inundation at building level

## Total buildings affected

- 2,231 very high (>8ft)
- 11,132 high (5-8ft)
- 70,887 medium (2-5ft)
- 274,608 low (<2ft)



# FLOOD INSIGHTS PRODUCT OUTPUT TIMING

## Communication to Government

DAILY

START TO PEAK

IMMEDIATELY AFTER PEAK OF FLOOD

AFTERMATH

FLOOD MONITORING

START OF FLOOD

PEAK OF FLOOD

FEW HOURS

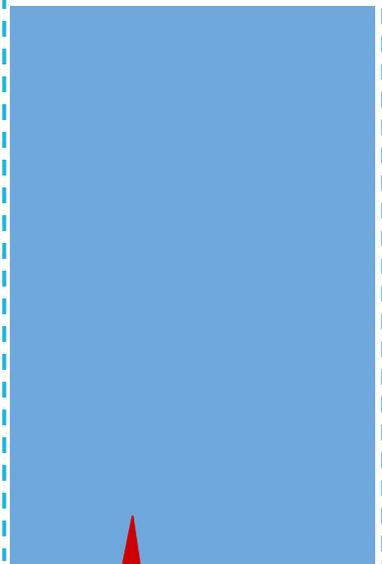
24HR

48HR



ICEYE Forecasted Flood Event Report

| Area   | Forecasted Flood Event |
|--------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Area 1 | Forecasted Flood Event |
| Area 2 | Forecasted Flood Event |
| Area 3 | Forecasted Flood Event |
| Area 4 | Forecasted Flood Event |
| Area 5 | Forecasted Flood Event |



Initial list of impacted locations - New South Wales, Australia (4 July 2022)

Local Government Area	Maximum number of impacted buildings	Average depth (cm)	Area (ha)	Status
Chipping Norton	10	100	100	Impacted 4 July
Condon	10	100	100	Impacted 4 July
South West Slopes	10	100	100	Impacted 4 July
Connangara	10	100	100	Impacted 4 July
Wentworth	10	100	100	Impacted 4 July
Wentworth South	10	100	100	Impacted 4 July
Wentworth North	10	100	100	Impacted 4 July
Stuyvesant	10	100	100	Impacted 4 July
Wentworth West	10	100	100	Impacted 4 July
Wentworth East	10	100	100	Impacted 4 July



TABULAR RELEASE NOTES

Area	Release Notes
Area 1	Release Notes
Area 2	Release Notes
Area 3	Release Notes
Area 4	Release Notes
Area 5	Release Notes



Meteorologists meeting for advanced flood detection

Daily flood report

Observed Flood Report

Flood event analysis release 1

Flood event analysis release 2

Flood event analysis release n

TIMELINE OF ENTIRE FLOOD EVENT

ICEYE initiates analysis when flooding is estimated to pass the analysis threshold of over 100 buildings impacted by at least 30 cm of flood waters.

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## DELIVERY OPTIONS

- 1 **DocSend**: We provide access to download files in a zip archive
- 2 **Cloud Sync**: Amazon S3 or Microsoft Azure, we can write directly to cloud storage
- 3 **Esri**: Provide data on ArcGIS Online via group sharing or **SFWMD HUB**

# USE CASES - FLOOD/HURRICANE RESPONSE

## Planning & Analysis

- Calibrating and assessing predictive modeling
- Utilizing historical flood data for zoning and land-use planning to minimize future flood risks.
- Comparing current flood zones with historical flood data to improve citizen communication on risk

## Remediation & Resilience Planning

- FEMA BRIC funding & grants: guide the allocation of post-event resilience funding.
- Utilize for flood mitigation and infrastructure improvements.
- Identify areas with potential health/safety risks and address post-flood health concerns.



## Situational Awareness and Response

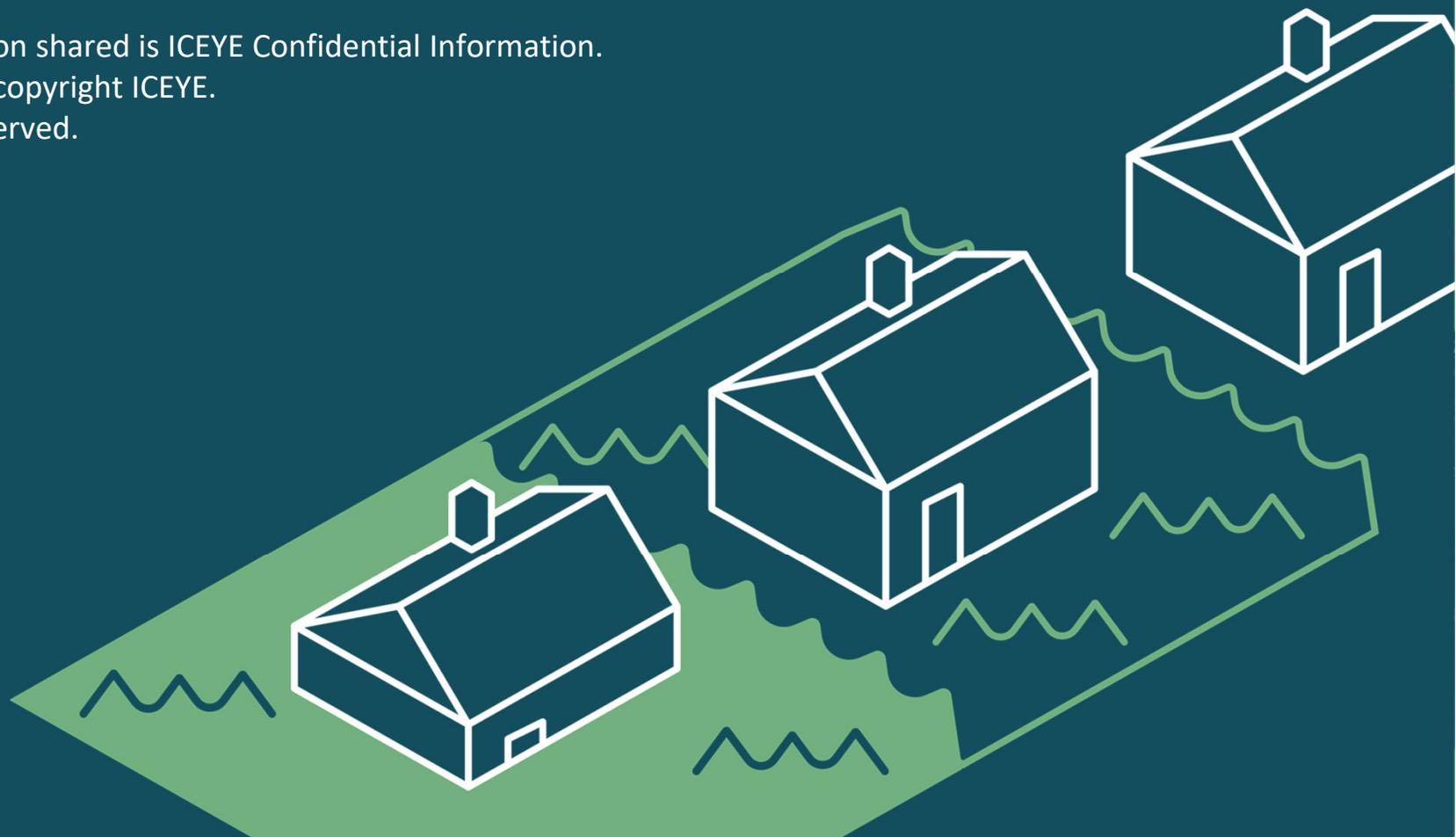
- Assist search and rescue teams in identifying flood impacted areas with the highest need for assistance
- Optimize the deployment of emergency response teams, equipment, and supplies to the high-priority areas
- Identify safe evacuation routes and monitor their potential impact from flooding
- Prioritize High Water Mark collections based on ICEYE impact data

## Post-Event Support & Damage Assessment

- Support preliminary damage assessments and subsequent disaster declarations
- Prioritize recovery efforts by identifying areas that require immediate attention
- Use data to assess the extent of damage to buildings, roads, and utilities

# ICEYE

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# 9C. Flood Tracking in South Florida

**Julia Kumari Drapkin, CEO and Founder, ISeeChange**



**I SEE  
CHANGE**

Community Climate & Weather Journal

# SFWMD Resiliency Coordination Forum

Julia Kumari Drapkin

Founder & CEO

[www.iseechange.com](http://www.iseechange.com)

February 2024

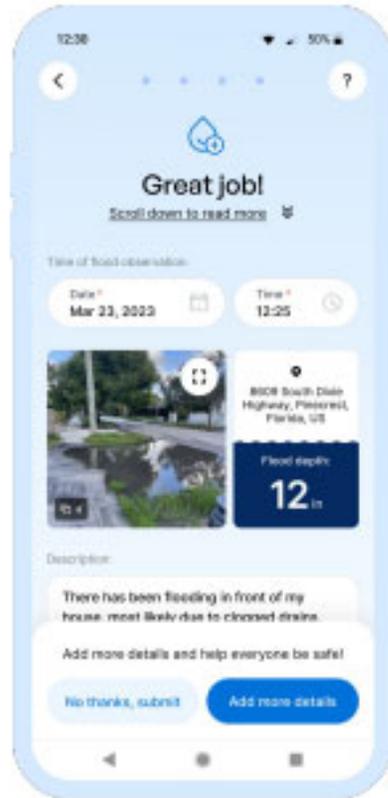
# What is ISeeChange?

ISeeChange is an AI-enabled data and community engagement platform that equips local governments and utilities with the data and insights they need to respond to climate impacts

## Community Engagement App

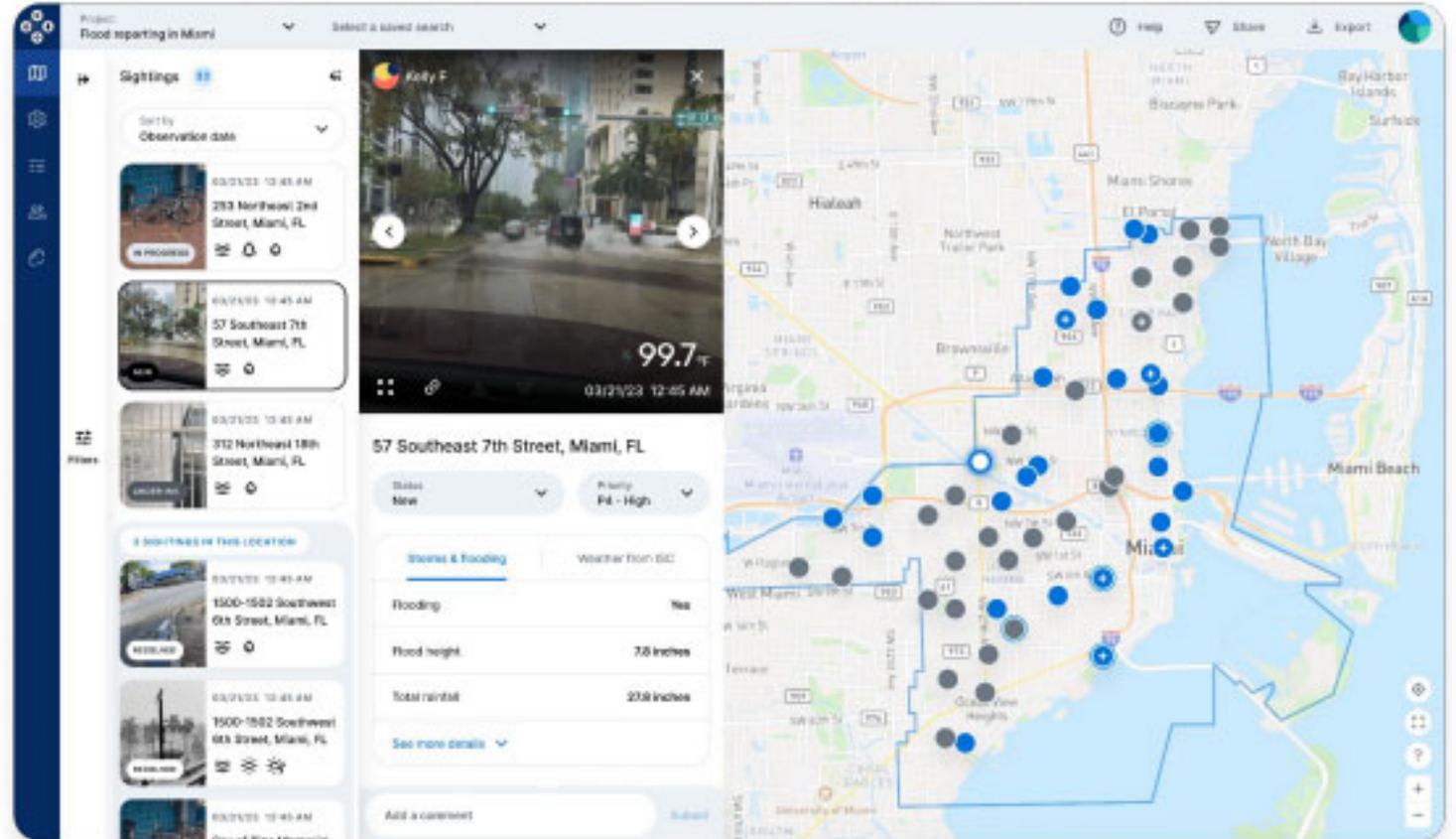


Detailed issues



Hyper-Local Data

## Insights Platform



Prioritized Actions for Efficient Response

ISeeChange can connect South Florida residents to more efficiently monitor, maintain, and plan for climate-ready infrastructure **together**.

Hyper-local engagement  
and resident recruitment



High-leverage, real time,  
AI-driven data



Incident management  
and planning



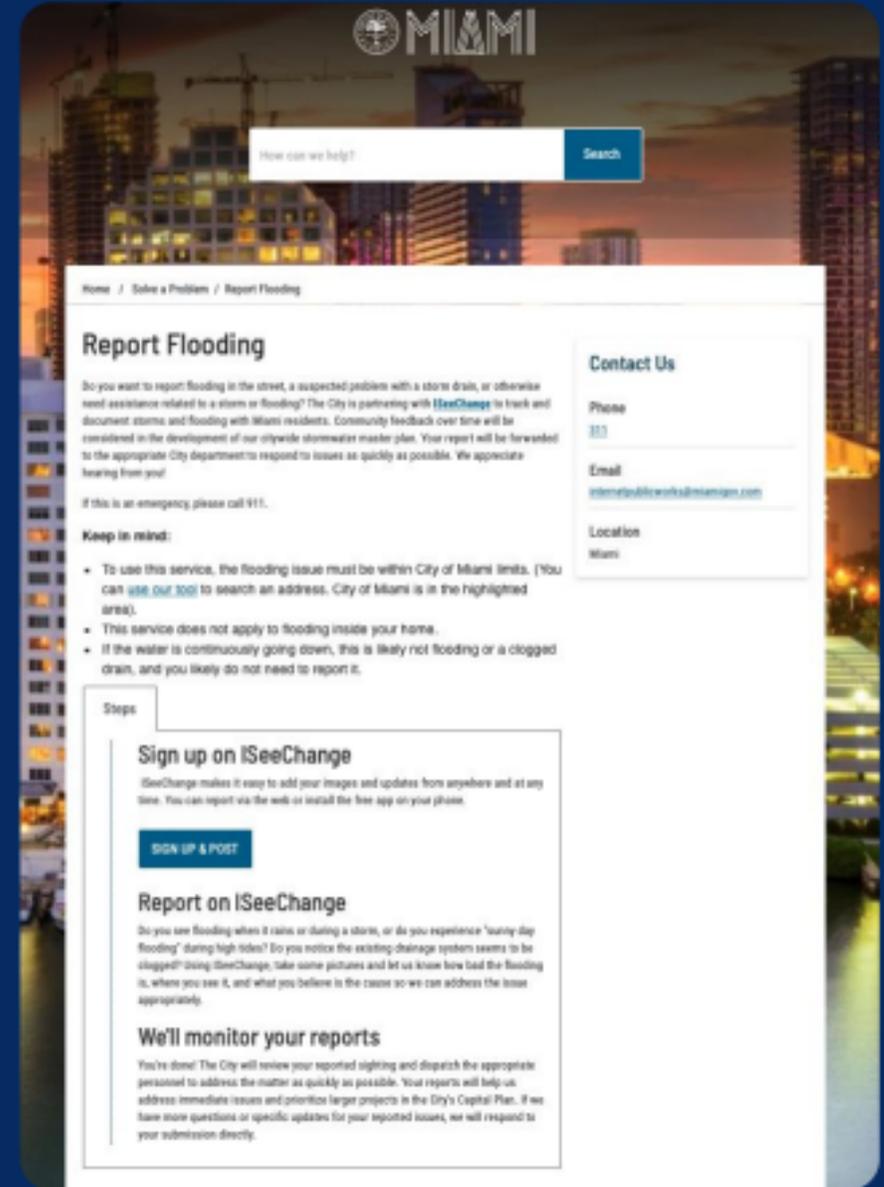
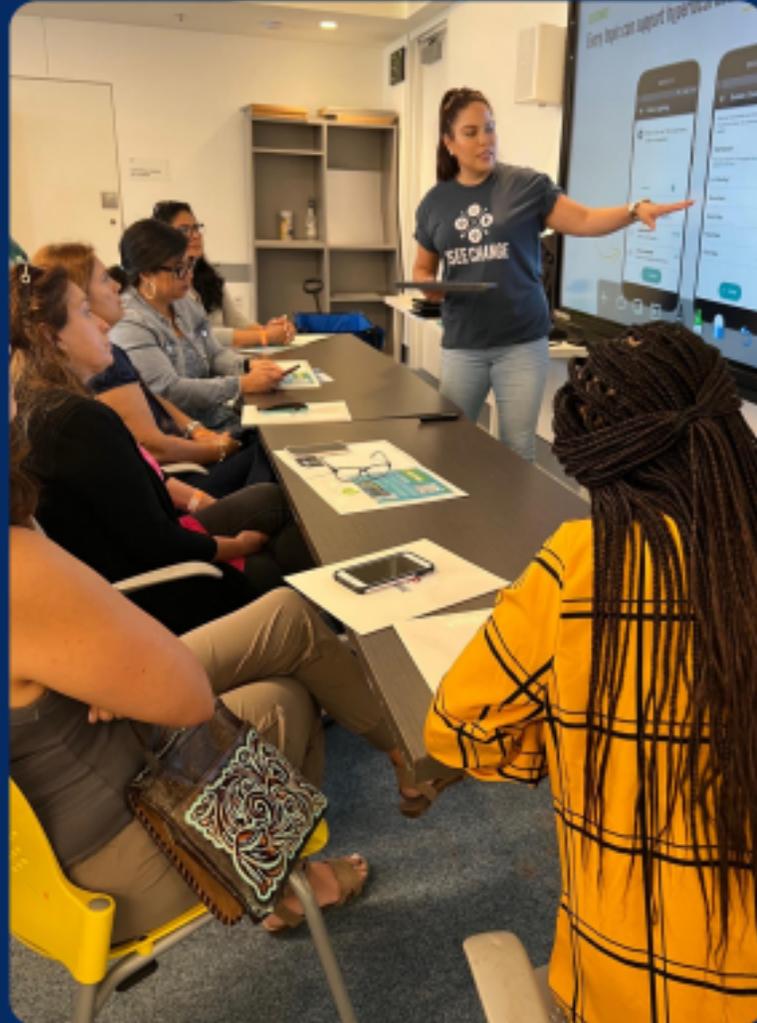


**ISEE  
CHANGE**

Community Climate & Weather Journal

# Hyperlocal engagement + resident recruitment

# Partnered promotion & events with local partners



**City of Miami** @CityofMiami · Dec 15, 2023  
As we go into the weekend, hazardous winds, heavy rainfall, and flooding are possible in the #CityofMiami. If you see flooding or other impacts, report it on @ISeeChange. Your reports will help the City prioritize response and design solutions going forward. Visit...  
[Show more](#)

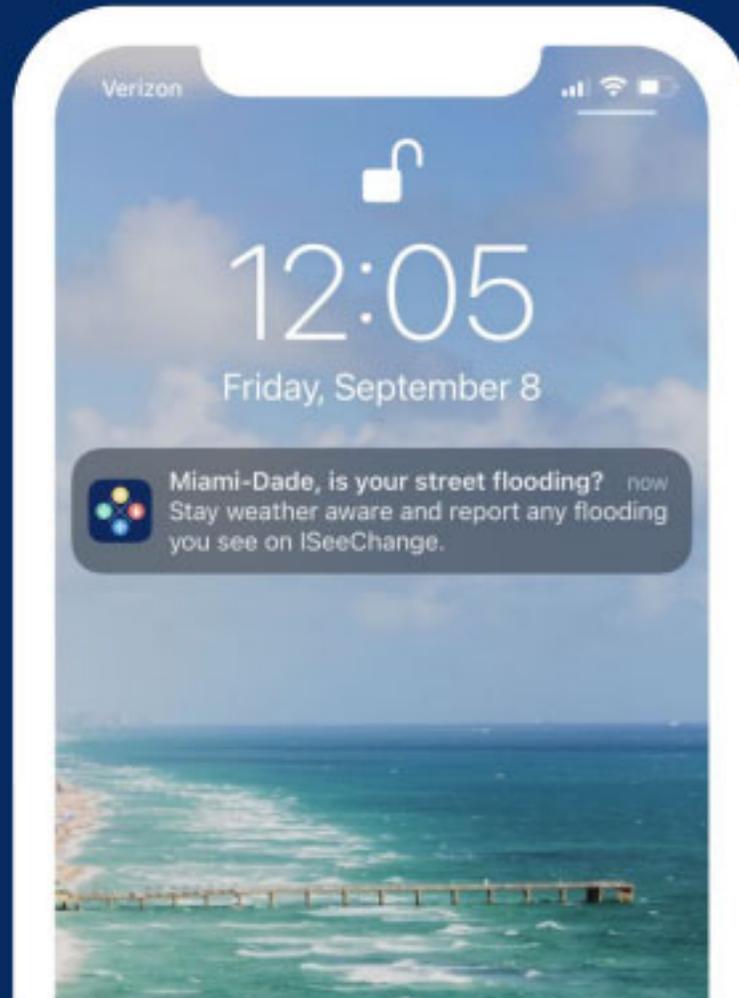
**Do you see flooding?**  
Share photos and stories with the City of Miami to help bring solutions to report flooding and prioritize long-term solutions for your neighborhood.

**ISEE CHANGE**

Sign up and start posting today!  
[www.iseechange.com](http://www.iseechange.com)

# Complementary Messaging Strategy: Realtime & Event-driven

Real-time alerts directly to residents phones with tailored messaging



## First Day of School Flooding



*"Flooding after several hours of rain."*

*—Susan C., Miami FL*

Many students across Miami Dade County returned from summer vacation to their first day of school today. Afternoon dismissals, routes home were challenged by a string of powerful thunderstorms—three separate flood advisories were issued, which concluded at 5:15pm ET.

Residents across the City of Miami and Miami Dade County have been reporting localized flooding throughout the afternoon. While the rain provides a much needed relief from the heat, be sure to stay weather aware and avoid driving on flooded streets while waters still recede.

### ISeeChangers in the Greater Miami Area:

Did you see any flooding this afternoon?

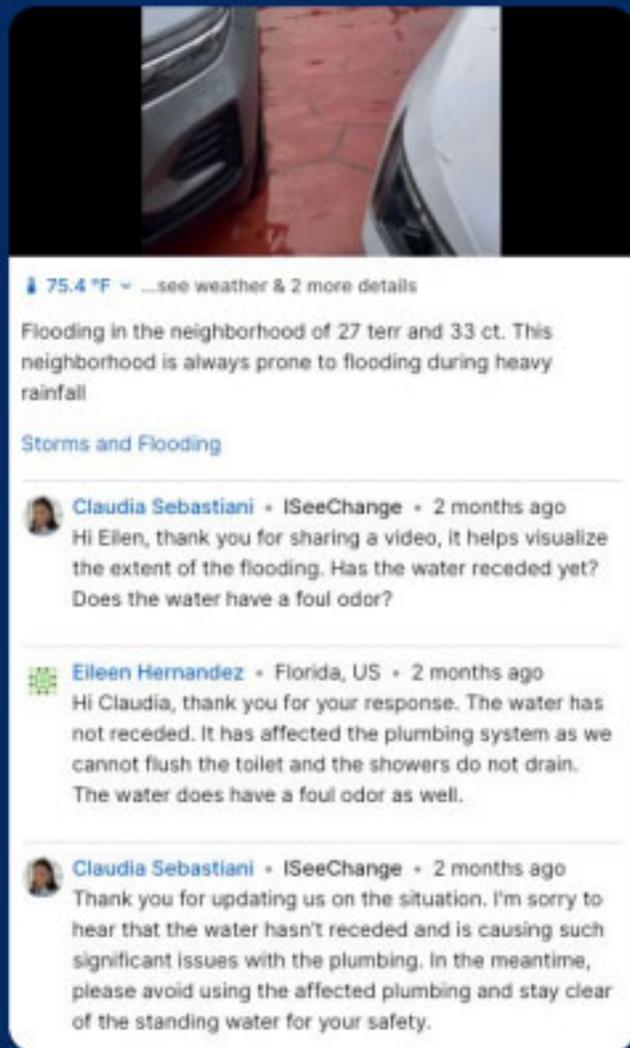
How long did it last?

Let us know in a quick post by sharing photos, videos, and measurements on ISeeChange.

[Post on ISeeChange](#)

# Driving resident education & stewardship

Community managers monitoring and engaging with residents, gathering more data and providing resources



75.4 °F ...see weather & 2 more details

Flooding in the neighborhood of 27 terr and 33 ct. This neighborhood is always prone to flooding during heavy rainfall

Storms and Flooding

**Claudia Sebastiani** • ISeeChange • 2 months ago  
Hi Eileen, thank you for sharing a video, it helps visualize the extent of the flooding. Has the water receded yet? Does the water have a foul odor?

**Eileen Hernandez** • Florida, US • 2 months ago  
Hi Claudia, thank you for your response. The water has not receded. It has affected the plumbing system as we cannot flush the toilet and the showers do not drain. The water does have a foul odor as well.

**Claudia Sebastiani** • ISeeChange • 2 months ago  
Thank you for updating us on the situation. I'm sorry to hear that the water hasn't receded and is causing such significant issues with the plumbing. In the meantime, please avoid using the affected plumbing and stay clear of the standing water for your safety.

Language change over time is a quantitative indicator of learning on the platform



Destiny Bell  
May 11

**MAY**

This flooding happens every single time

There is the old saying that it rains every single time it rains. This is after only 30 minutes of rain, leaving a few feet of water. This is dangerous for fish. The debris from the road also ends up in my yard after storms. It's also a school bus stop, so kids waiting here for the bus are exposed to these conditions.

1 0 75.4°



Destiny Bell  
Investigating Flooding  
Aug 20

**AUG**

I wanted to find the correlation between flooding and the amount rainfall with how long it rained.

Not flood... enough to be... Harrison and St. Bernard (pictures attached). Nonetheless, in anticipation of Wednesday's weather, some people in my neighborhood have parked their cars on the normal ground (picture attached).

Shared on August 20th, 2017

1 0 75.4°



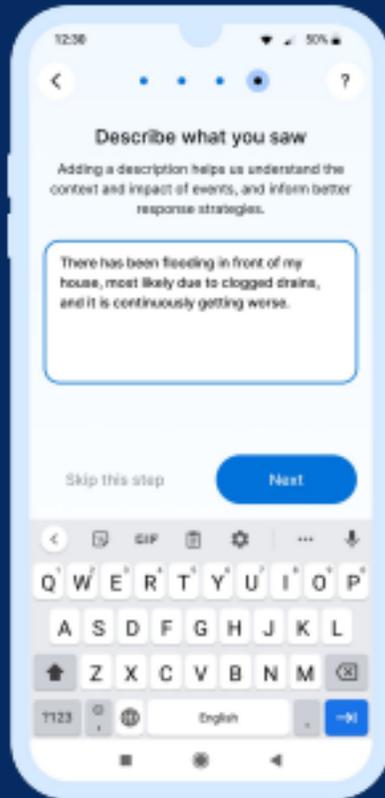
I SEE  
CHANGE

Community Climate & Weather Journal

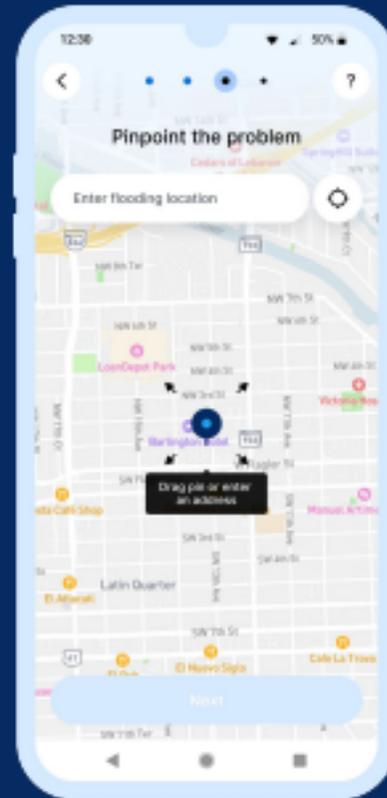
High-leverage +  
real time flooding data

# The User Experience

Efficiently collecting & centralizing data & feedback to prioritize solutions and save time



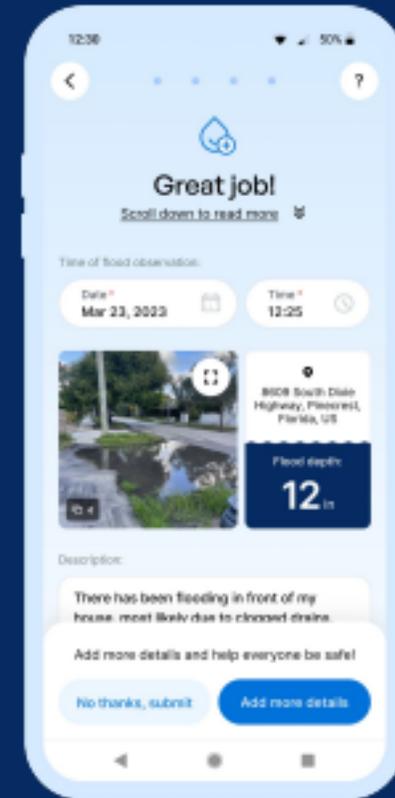
Real Time



Geo Social



Context



Hyper-Local Data

# Hyper-local Value & Community Trends

with each contribution

## GIS Data/ESRI

Target areas in need of prioritized attention.

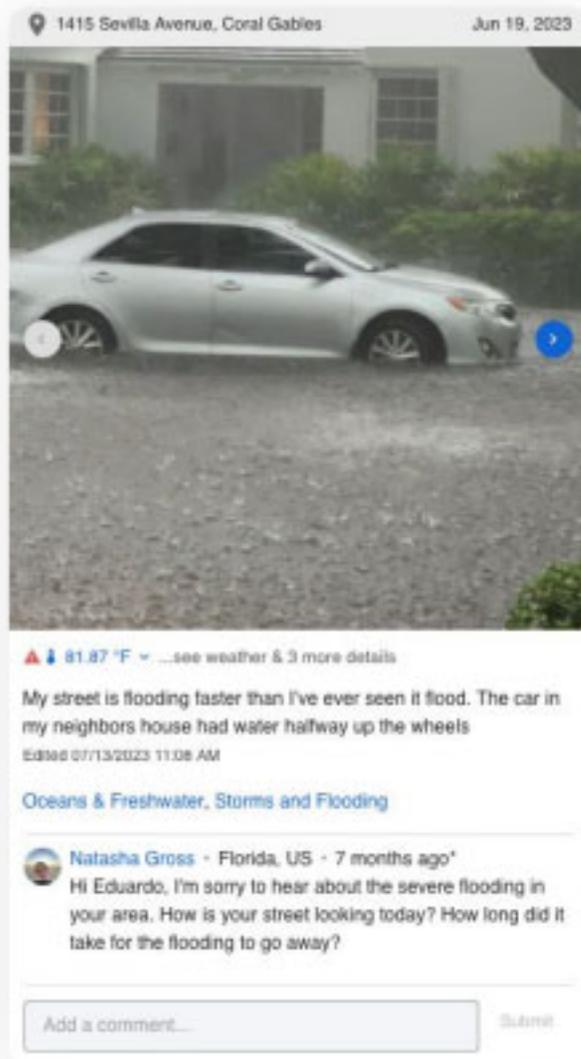
## Impact Images

## Impact Stories

Understand community need, severity, health concerns and community led solutions/ideas.

## Dialogue

Discuss details and solutions with residents in real time.



1415 Sevilla Avenue, Coral Gables Jun 19, 2023

81.87 °F ...see weather & 3 more details

My street is flooding faster than I've ever seen it flood. The car in my neighbors house had water halfway up the wheels

Edited 07/13/2023 11:08 AM

Oceans & Freshwater, Storms and Flooding

Natasha Gross · Florida, US · 7 months ago\*

Hi Eduardo, I'm sorry to hear about the severe flooding in your area. How is your street looking today? How long did it take for the flooding to go away?

Add a comment... Submit

## Custom Sensors & Measurements

Activate communities to help measure and fill data gaps around local impact.

DETAILS	WEATHER	+ many more
TOTAL RAINFALL	5 INCHES	
RAIN START/STOP TIME	6/19/2023 12:38 PM-6/19/2023 2:38 PM	
FLOOD HEIGHT	3 INCHES	

This day's high could be abnormally high and this day's low could be abnormally low compared to the last 30 years!  
[Learn about the data](#)

Local data from nearby weather networks for Coral Gables, Florida, US on Jun 19 2023, 02:32 PM

SUMMARY	SCATTERED STORMS
FEELS LIKE	88.73°F
CLOUD COVERAGE	85.00%
HUMIDITY	81.00%
PRECIPITATION (LAST 12 HOURS)	0.8 INCHES
DEW POINT	75.46°F
PRESSURE	29.99 MBAR
WIND BEARING	203°
WIND SPEED	3.31 MPH

Source: aeriweather.com

## Data API Integrations

Each submission is synced with climate and weather network data which can include official municipal or regional sensor networks via API.

# City of Miami Case Study

**\$20M+** Impact



## 1. Activate

**Centralizes data** across city departments and local organizations.

## 2. Notify

Facilitates direct service requests with the City. **First to report** pump outages during Tropical Storm Eta. Triaging citywide response during PTC1 and Hurricane Ian. Receives same number of posts as 911.

## 3. Track

Residents demonstrate inland flooding in non-english speaking neighborhoods is **more severe than modeling suggests**.

## 4. Analysis & action

ISeeChange data used to win **\$20M** in grants.  
ISeeChange cited in City's **Bloomberg smart city certification**.

Pilot with Miami Dade County to track flooding, heat, and pollution.



**I SEE  
CHANGE**

Community Climate & Weather Journal

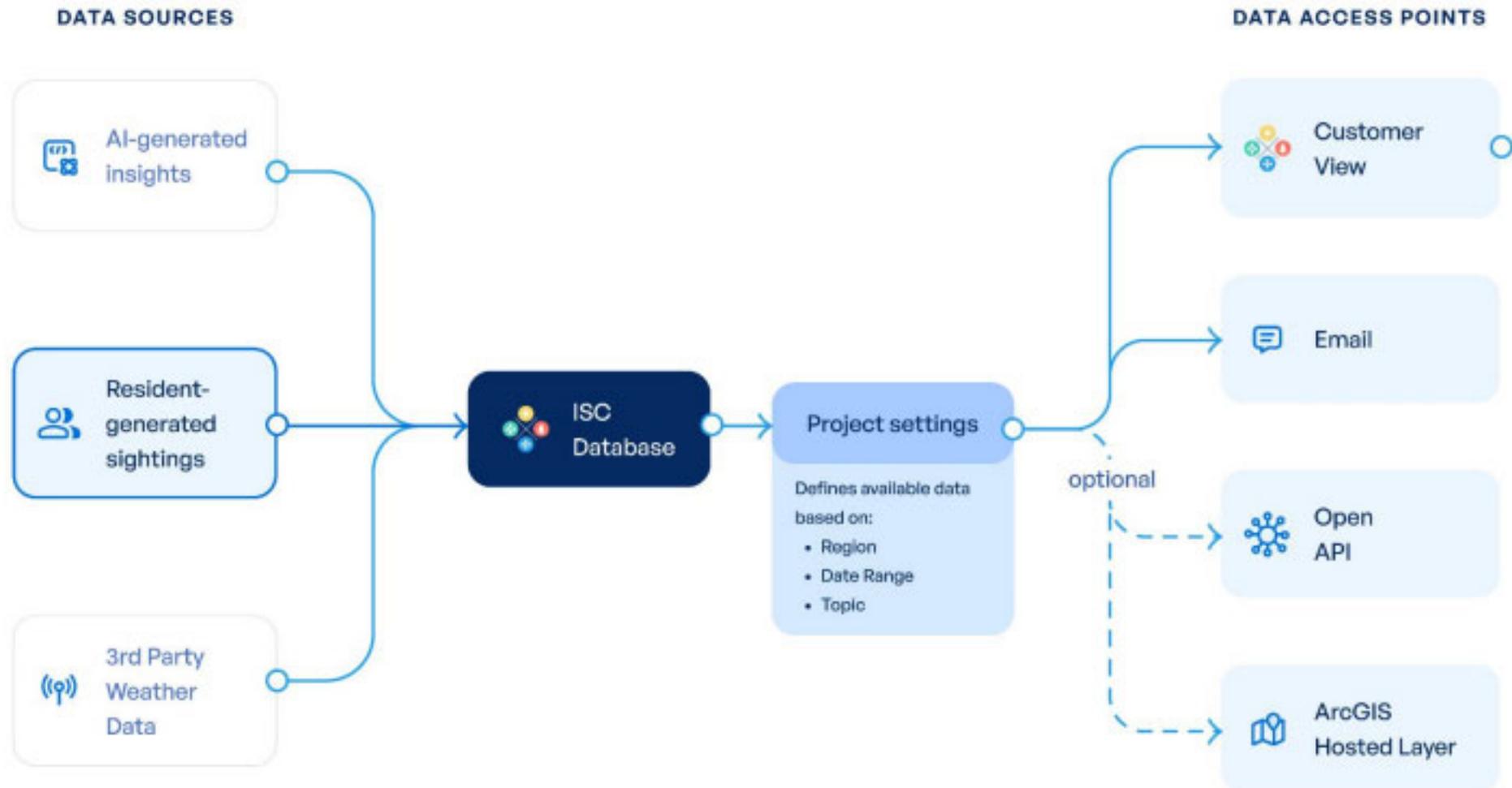
# Incident management & planning across stakeholders

# Delivering data where it needs to go.

ISC sightings fields can map 1:1 to match the feature attributes your layer expects

To configure the integration, ISC only needs a few simple details regarding your ArcGIS Online account set-up

Our ArcGIS Online integration adds features to new or existing feature layers in real-time



Sightings 32

Sort by Observation date

03/21/23 12:45 AM  
57 Southeast 7th Street, Miami, FL

NEW

03/21/23 12:45 AM  
253 Northeast 2nd Street, Miami, FL

UNDER INV.

03/21/23 12:45 AM  
312 Northeast 18th Street, Miami, FL

IN PROGRESS

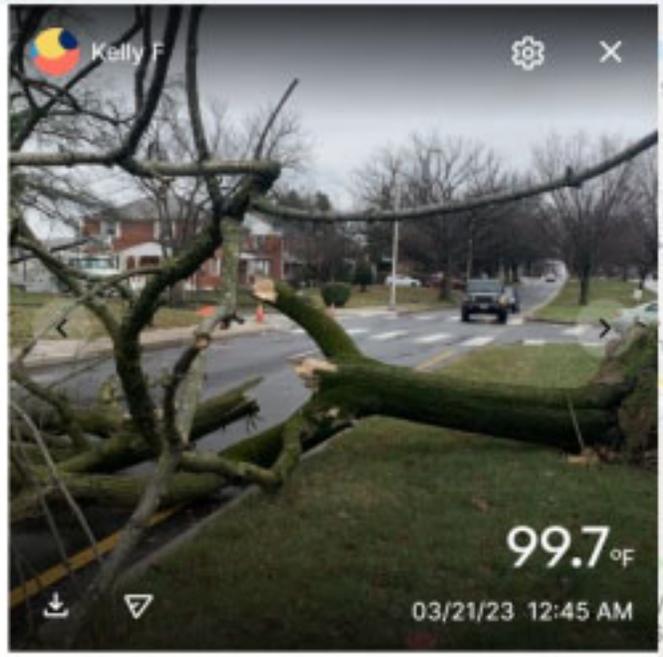
03/21/23 12:45 AM  
1500-1502 Southwest 6th Street, Miami, FL

RESOLVED

03/21/23 12:45 AM  
Bay of Pigs Memorial park, Miami, FL

RESOLVED

03/21/23 12:45 AM



57 Southeast 7th Street, Miami, FL

Status: New  
Priority: P4 - High

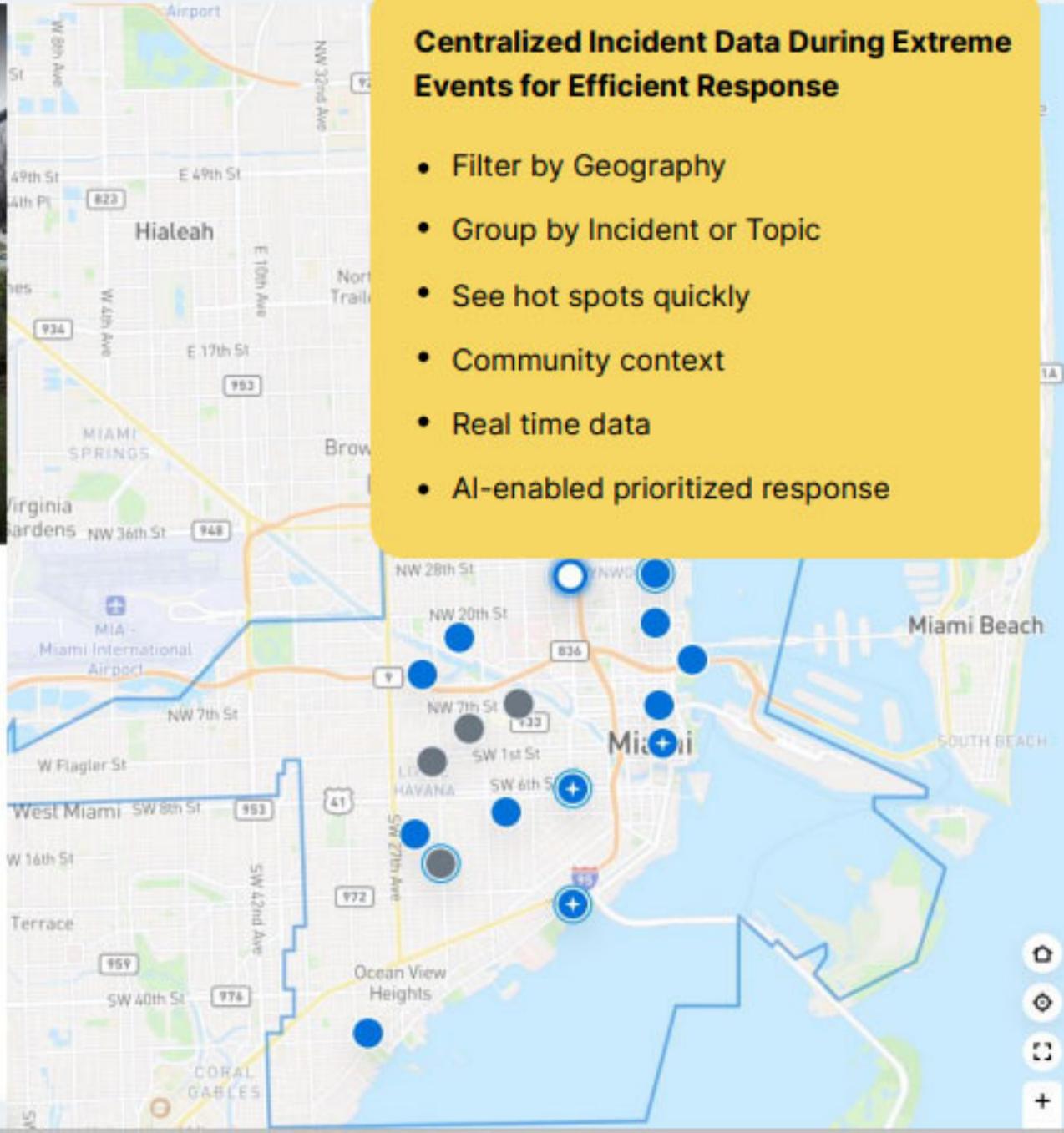
Plants & Trees | Weather from ISC

Tree species: Oak

Tree circumference (Caliper): 7.8 inches

Requires maintenance: **Downed Tree**

[See more details](#)



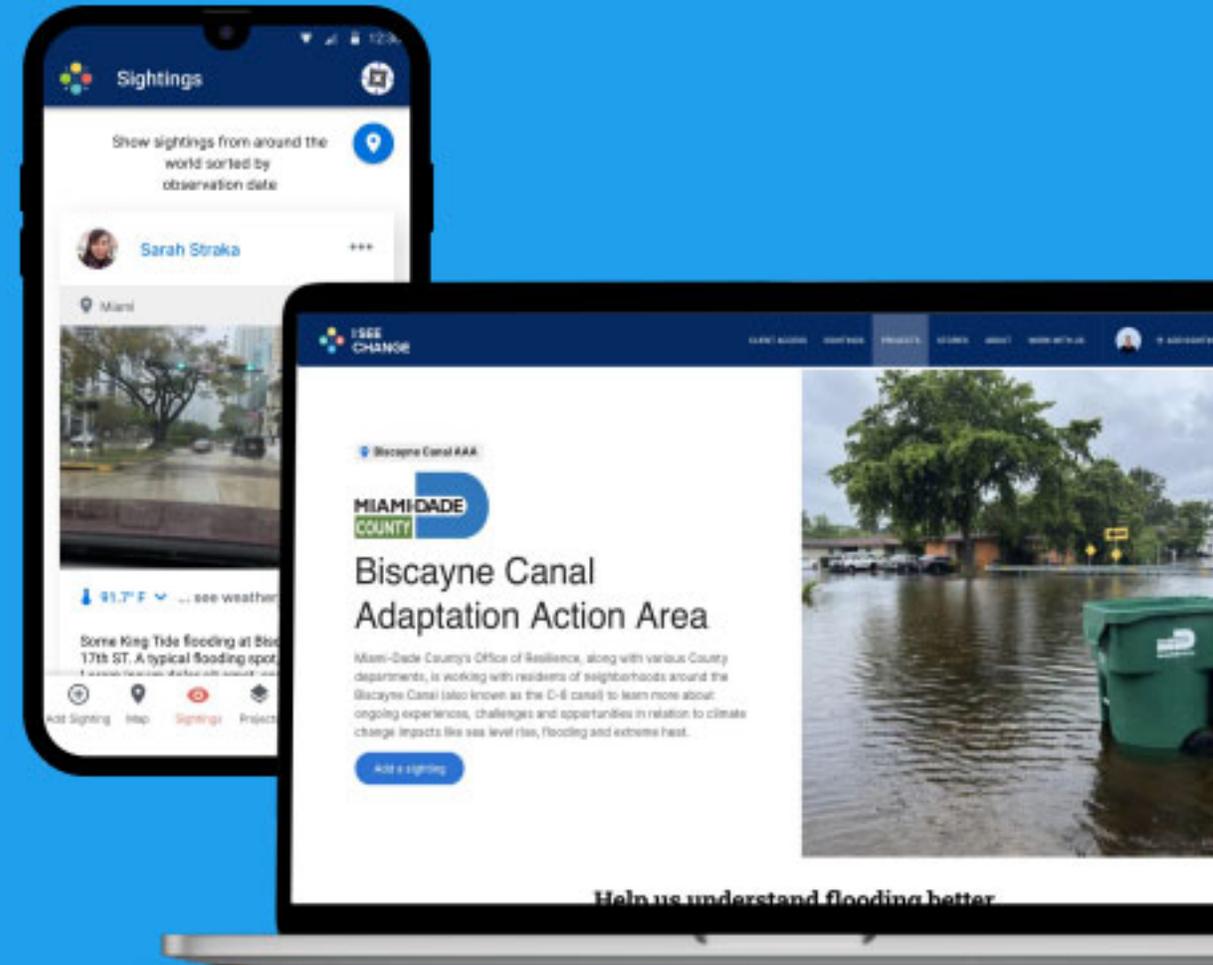
**Centralized Incident Data During Extreme Events for Efficient Response**

- Filter by Geography
- Group by Incident or Topic
- See hot spots quickly
- Community context
- Real time data
- AI-enabled prioritized response

Filters

# County and Municipal Use Cases for ISeeChange

- Situational awareness and real-time communication
- Hot spot identification and preparedness
- Triage and augments both 311 and 911 systems
- Model validation
- Federal and state grant applications
- Design-build infrastructure projects
- Community stewardship and trust building



Get in touch with us to schedule a demo.



**I SEE  
CHANGE**

Community Climate & Weather Journal

**Julia Kumari Drapkin**  
*Founder & CEO*  
[julia@iseechange.com](mailto:julia@iseechange.com)

Or visit:  
[partners.iseechange.com](https://partners.iseechange.com)



# ACTION

Dr. Carolina Maran

## Local Government Partner Wet Season Call To Action

- Promote flood observation survey applications on local outreach/social media efforts
- Acquire a **Flood Information Resource** Account
- Login to the **Flood Information Resource** to monitor incoming reports
- Sign available staff up for flood observation surveys and high-water mark **training**
- Attend training and download applications to a mobile device, as needed
- Deploy staff to mark and measure high water marks, as available

# High Water Mark / Flood Observation Training Opportunities

- Training is open to Local Government Staff
- Sign Up is through Microsoft Form
- First Come First Serve
- Training Locations, Dates, and Times
  - West Palm Beach Field Station – Tuesday, April 2, 9:30 – 12:30
  - Big Cypress Basin Field Station – Tuesday, April 9, 9:30 – 12:30
  - Clewiston Field Station – Thursday, April 11, 9:30 – 12:30
  - Fort Lauderdale Field Station – Wednesday, April 17, 9:30 – 12:30
  - Homestead Field Station – Tuesday, April 23, 9:30 – 12:30
  - Miami Field Station – Wednesday, April 3, 9:30 – 12:30
  - Okeechobee Field Station – Wednesday, April 24, 9:30 – 12:30
  - St. Cloud Field Station – Thursday, April 18, 9:30 – 12:30

