SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Flood Survey And High Water Mark Training

April and May 2026

sfwmd.gov

Introductions

- Your name, what you do, and your organization
- Your experience with*
  - Flooding data and/or high water marks
  - GIS applications/mobile mapping
- Please also mention if you have attended one of SFWMD's Flood Survey and High Water Mark Survey Training sessions in previous years

*If your answer is none or very little – that's okay! We'll cover it today.

Objectives

- By the end of this training, our goal is that all participants:
  - Understand the importance of flood observation and high water mark (HWM) data collection
  - Know which resources to use and how to effectively capture data with them
  - Know how to safely and accurately identify and collect high water marks
  - Submit test data using the different applications to ensure users are ready and prepared for the upcoming wet season

Agenda

- An overview of the SFWMD's resiliency initiatives and the importance of flood/high water mark data collection
- Training on how to use data collection resources
  - Which application to use and when
  - How to completely and properly collect data
- Survey 123
  - Flooding and Early Concerns
  - High Water Marks
- Testing & data review

Introduction Video (Click To Play)

Ana Carolina Coelho Maran, Ph.D., P.E.
Division Director, Flood Control and Water Supply Planning,
Chief of District Resiliency

SFWMD's Resiliency Initiatives

- The Division of Flood Protection and Water Supply Planning coordinates planning and implementation efforts, working closely with internal teams and with local, state, and federal partners

- Together, we support water supply and flood control planning, advance resiliency initiatives, and move projects toward implementation

ENVISIONING A RESILIENT FUTURE

Our resilience vision is one where our water resources and ecosystems are restored and safeguarded, communities are protected from flooding, and water supplies remain sustainable and secure. We use the best available science, tools and data to support risk informed decisions and to adapt the District's infrastructure to continue to successfully perform under sea level rise and other changing climate and hydrologic conditions.

SFWMD's Resiliency Initiatives

- **District Resiliency | South Florida Water Management District (sfwmd.gov)**

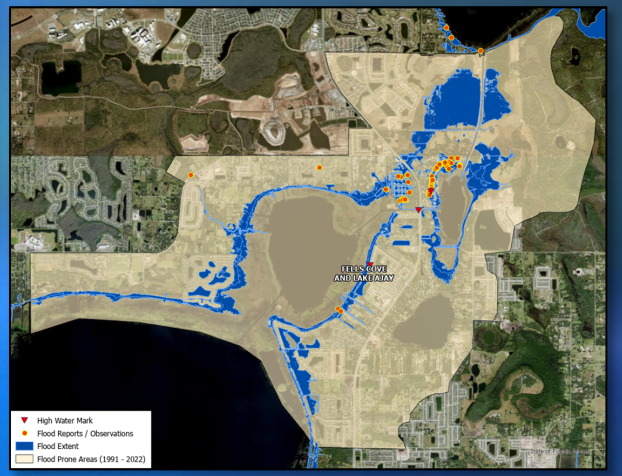
Resiliency is the capacity for natural and human-made systems to cope with and adapt to acute and chronic stressors as conditions evolve.

SFWMD's resiliency efforts focus on:

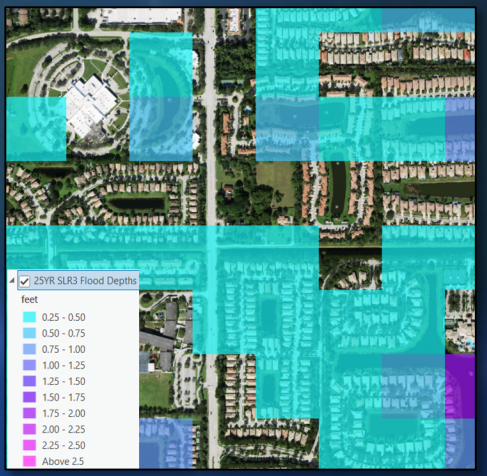
- **Assessing how sea level rise, extreme flood and rainfall events, land use, and other evolving conditions happen today and, in the future, and how they affect water resources management.**
- **Planning for infrastructure adaptation investments that are needed to successfully carry out SFWMD's mission of safeguarding and restoring South Florida's water resources and ecosystems, protecting communities from flooding, and meeting the region's water needs while connecting with the public and stakeholders.**
- **Implementing critical resiliency projects to improve storage and conveyance capacity, increase operational flexibility, integrate nature-based solutions and ecosystem restoration, while piloting new technologies that aid in protecting Central and Southern Florida's water resources.**

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



Hurricane Ian September 2022
East Lake Tohopekaliga / Fells Cove

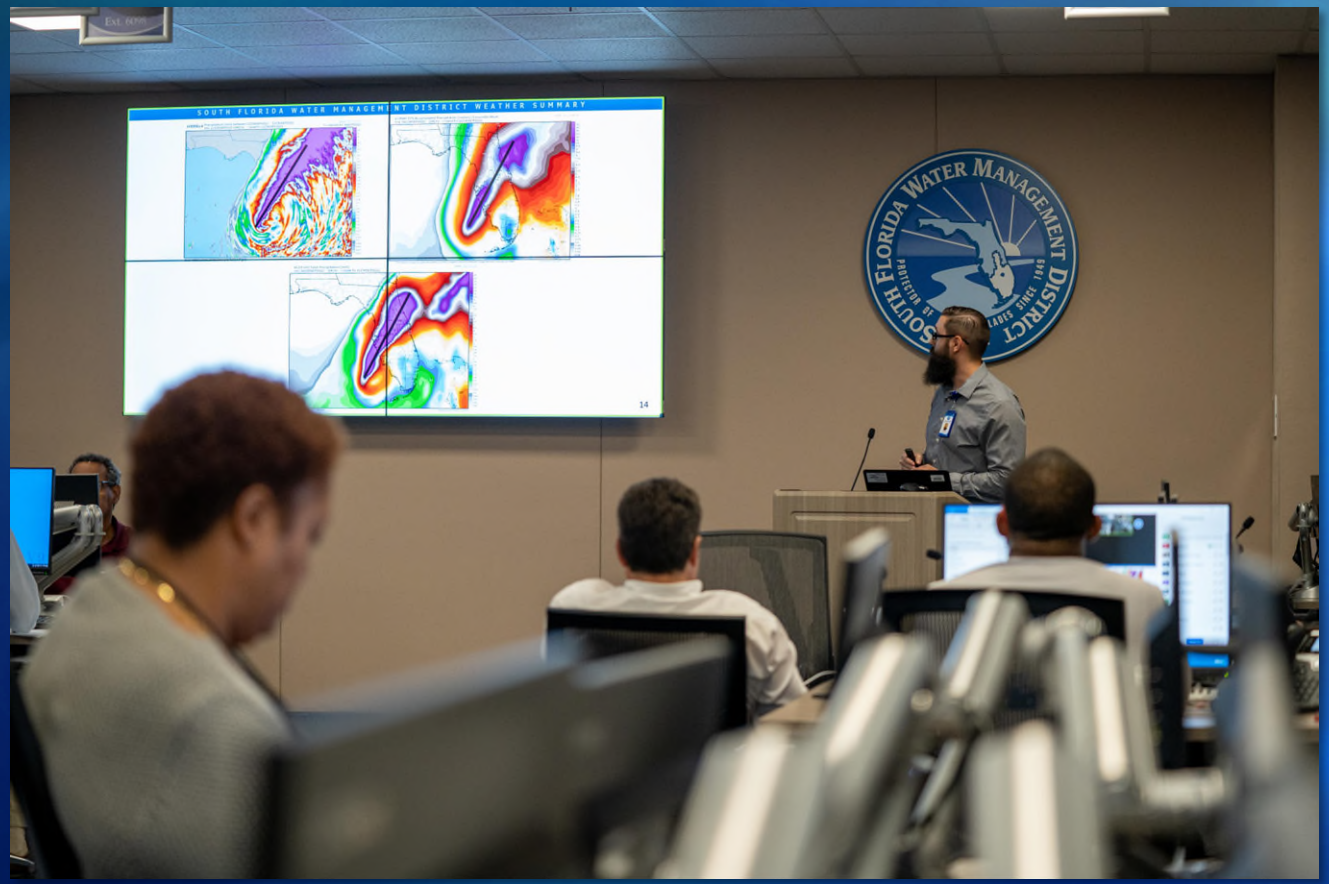


PM 5: Stage based LOS for sub-watersheds
sfwmd.gov/FPLOS

Objectives And Importance Of Data Collection

- Data collected via these applications
  - Gives SFWMD and local government and drainage district partners critical information about flooding – when and where it occurs, and the severity of impacts
  - Provides insights into vulnerable areas and root causes

Objectives And Importance Of Data Collection



- These data provide increased understanding of conditions on-the-ground, improve awareness of local impacts, and inform water management operations during EOC activations and
  - Heavy rainfall events
  - High-tide events
  - Tropical Storm and Hurricanes
  - Compound flooding events

SFWMD South Florida Flood Information Resource

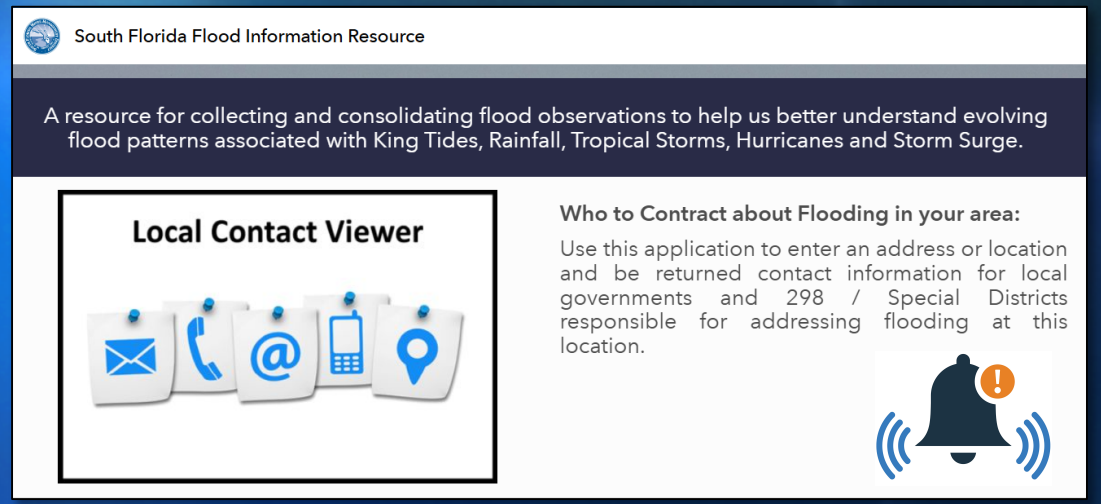
South Florida Flood Information Resource

- Find local contacts
- View flood observations
- View event data

Additional information can be found at Resiliency and Flood Protection | South Florida Water Management District

Local Contact Notification System

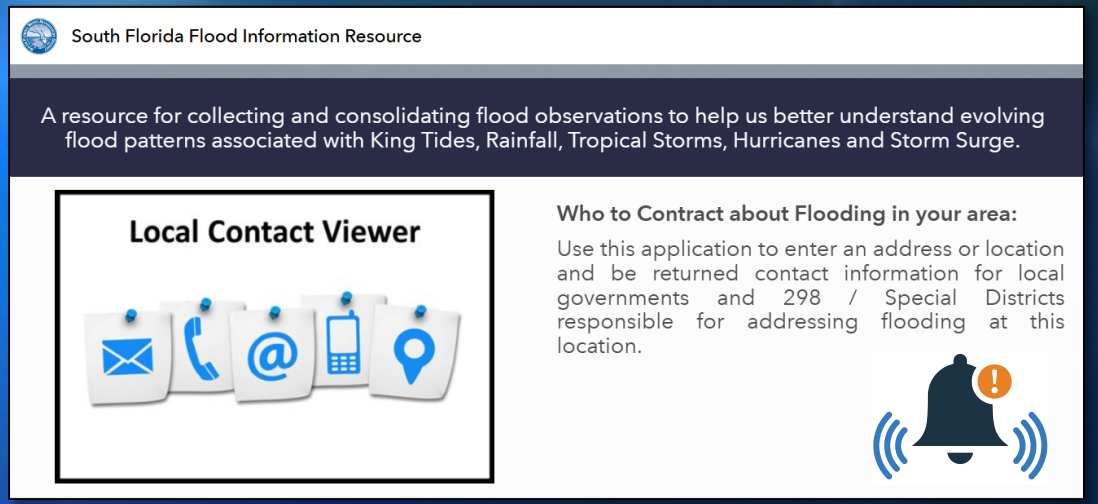
- Automatically notifies local County, City, and Drainage District contacts by email when a flood report is submitted within their jurisdiction
- Notifications include a direct link to the South Florida Flood Information Resource application for full report access



Additional information can be found at Resiliency and Flood Protection | South Florida Water Management District

Local Contact Notification System

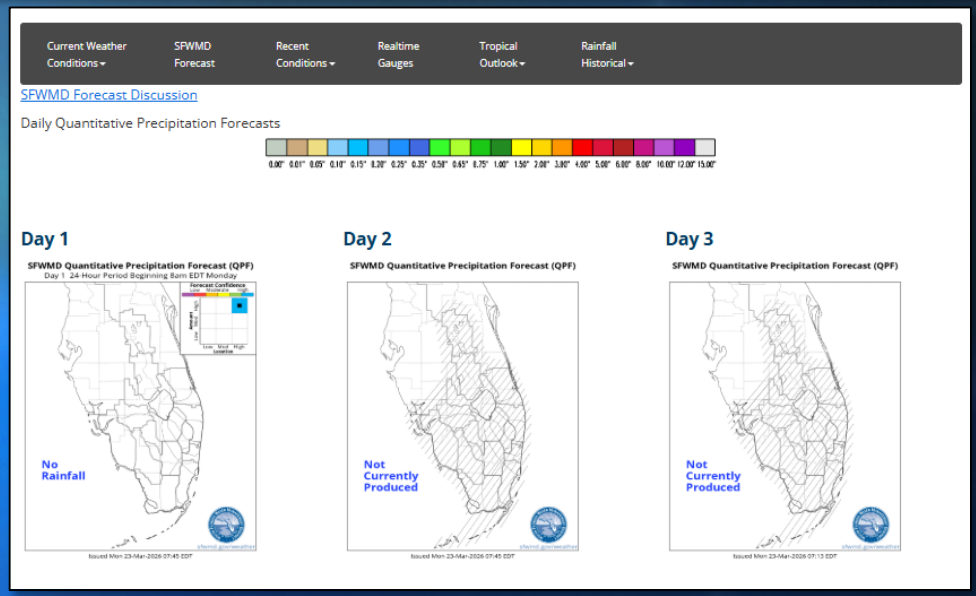
- A South Florida Flood Information Resource account is required for full access to reports and related information; see Account Creation Instructions
- Flood reports are being shared for awareness and informational purposes only

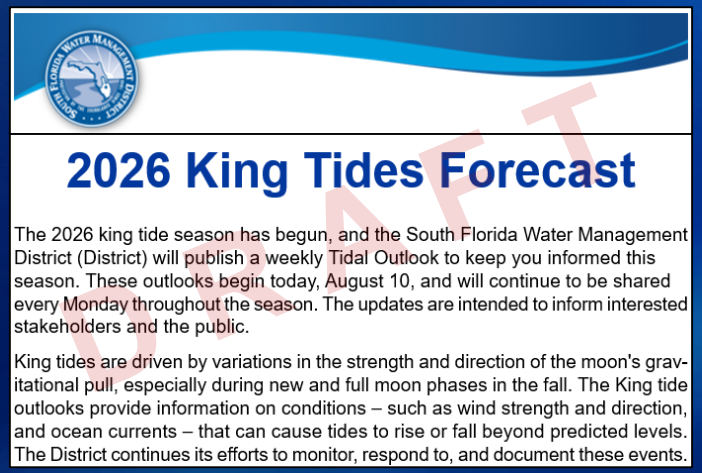


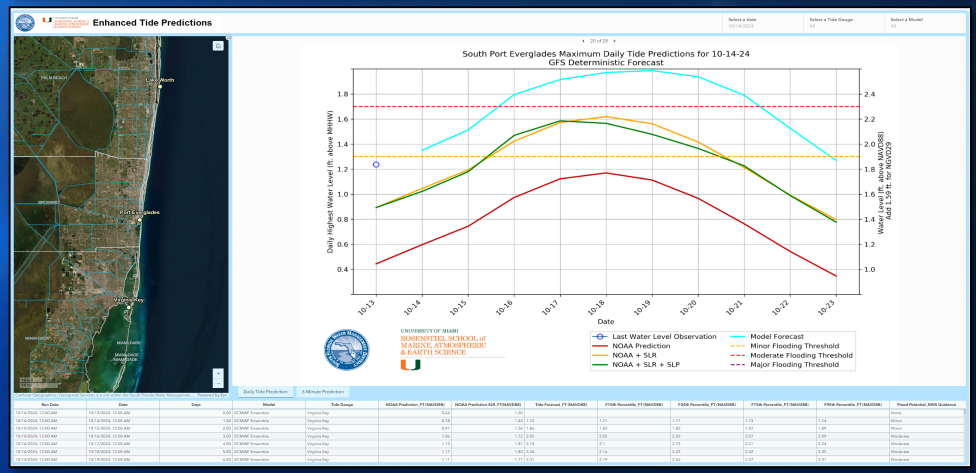
Additional information can be found at Resiliency and Flood Protection | South Florida Water Management District

SFWMD Weather And Tide Predictions

- Stay informed on regional and local conditions
  - SFWMD Weather Forecast
  - SFWMD.gov/HighTidePredictions
  - SFWMD Site Status

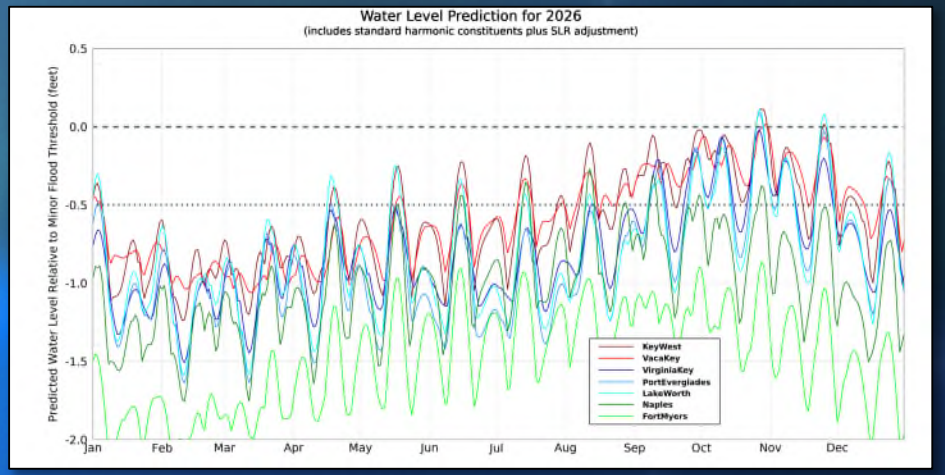






2026 King Tide Season

- During these periods, high tides may exceed one or more National Weather Service (NWS) flood thresholds in parts of the region
  - Enhanced Tide Predictions | Resilience Metrics Hub



Southeast Coast

Maximum Peak: October 27

- August 11 - 14
- September 8 - 15
- September 24 - October 15
- October 22 - November 12
- November 22 - 29
- December 22 - 27

Florida Keys

Maximum Peaks: October 28 & 30

- August 7 - 21
- August 24 - November 17
- November 19 - December 1
- December 4 - 13
- December 21 - 27

Southwest Coast

Maximum Peak: August 12

- August 10-14
- August 27-28
- September 8-11
- September 29 - October 1
- October 27-29

Overview Of Flood And High Water Mark Data Collection

- **Flood Survey**
  - Survey123 application or browser
  - Tool for agency use and public distribution
- **High Water Mark Survey**
  - Survey123 application or browser
  - Requires a Flood Information Resource Account
  - Florida Division of Emergency Management-Derived

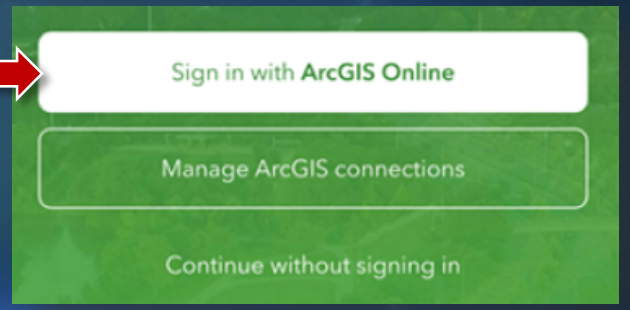
ArcGIS Survey123

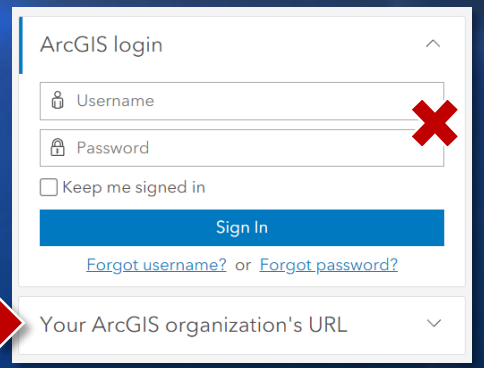
Signing Into Survey123

- Sign in is not required to access the Flood Observation Survey, but is required for the High Water Mark Survey
  - The Flood Observation Survey is open to the public
  - The High Water Mark Survey is restricted to trained individuals with Flood Information Resource Accounts
- For today's training, you will not have to sign in to the High Water Mark Survey
  - We've made temporary updates to the sharing permissions to allow this
  - Non-SFWMD participants should have received information about setting up their Resource Accounts, and will receive a follow up email
  - For SFWMD staff, we will go through the sign in process on the following slides

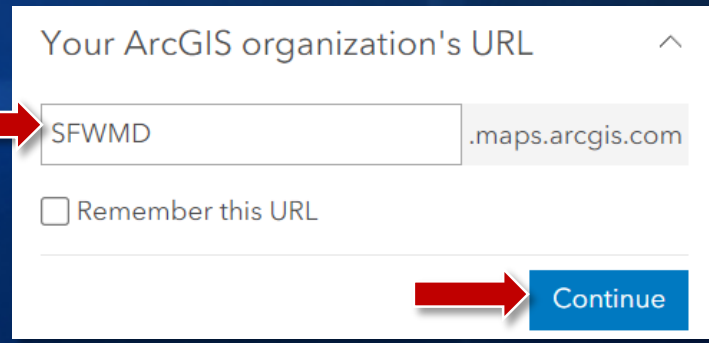
Signing Into Survey123 (SFWMD Staff)

- Choose “Sign in with ArcGIS Online”
- Choose to login with the ArcGIS organization URL
- Type in SFWMD
- Sign in using your District credentials
  - Use your full email (@sfwmd.gov) and regular password
- If prompted, go to the Microsoft Authenticator application on your trusted device and enter in the code to authenticate
  - If you don’t have the MFA app, please let us know after the presentation, and follow the instructions on the next slide



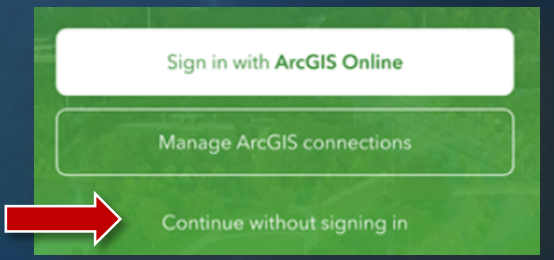


Do not type Account info in these boxes, it will not work.



Signing Into The App

- If you do not have the Microsoft Multi-Factor Authentication (MFA) application or are not SFWMD staff:



- For now, choose “Continue without signing in”
  - You can <u>always</u> choose this option if you’re collecting data in the Flood Observation Survey
- SFWMD staff
  - Please let us know after the presentation/before the testing time if you don’t have the MFA app

Signing Into The App

- SFWMD Staff: Please be sure you have signed in using the sign in sheet so we can look into your user license level and permissions in ArcGIS Online.
- Non-SFWMD Staff: You should have already received instructions detailing how to create your Flood Information Resource Account, which will be required for submitting the High Water Mark Survey beyond this training. Please speak with a member of the Flood Observations team if you need assistance or email FloodReportReviewers@sfwmd.gov.

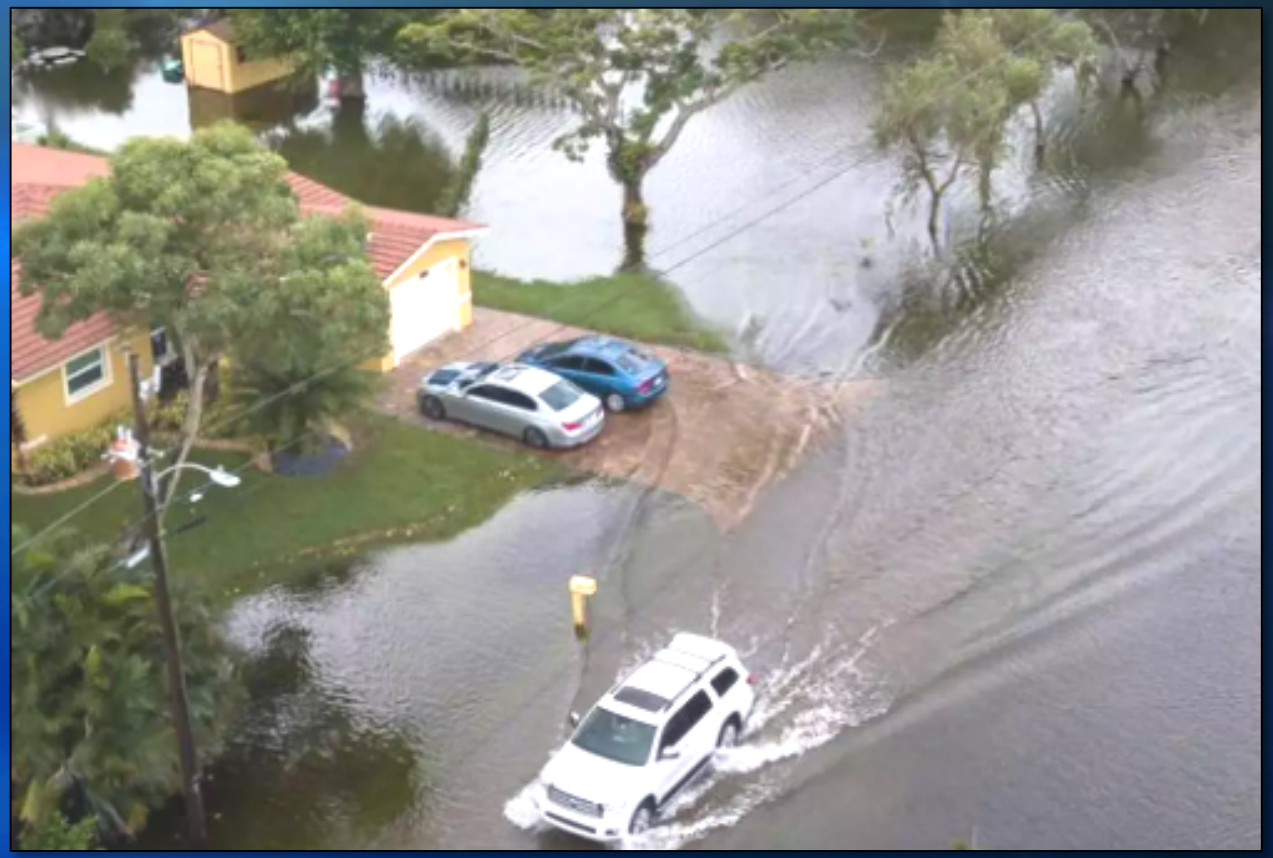
Flood And High Water Mark Surveys – Previous Versions

- **IMPORTANT: If you have participated in past years' trainings and used the Flood and/or High Water Mark surveys previously, the surveys saved onto your device in the Survey123 application are no longer valid**
  - The surveys must be deleted from your device as they will no longer work going forward
  - Please use the QR codes in this presentation and in your handout to ensure the latest versions are saved to your device

ArcGIS Survey123

Defining Flooding And Flood Concerns

- Flooding is water in areas that are not designed to hold it or where it is not normal for it to occur
  - *Not* water in swales, wetlands, or retention ponds, unless it is rising quickly or there is cause for other flooding concern
- A flooding/early concern may refer to water rising nearby, representing early flooding risks to the current location



Identifying Flooding And Flood Concerns

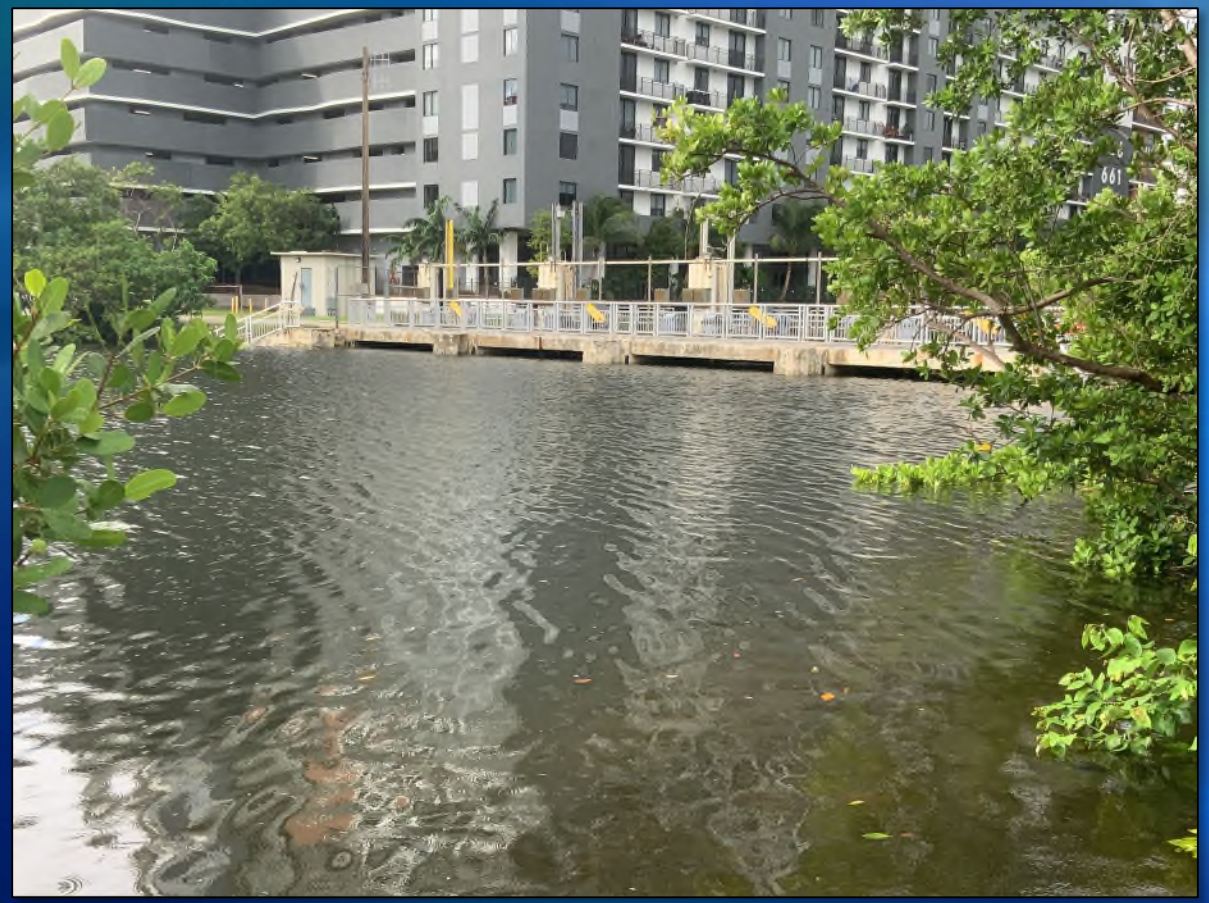
Flooding

Delray Beach, 2024

Flood Concern

Jupiter, 2025

Flooding Or Flood Concern?



Miami, 2025

Flood Concern

Water levels are close to the top of the water control structure, but are not *yet* over the top of it. All the water is still in the water body, however, it is still a concern for flooding

Flooding Or Flood Concern?

Boynton Beach, 2025

Flooding

Water is in the road, which is considered active flooding, even if it is “sunny day flooding,” which can be observed during King Tides, for example

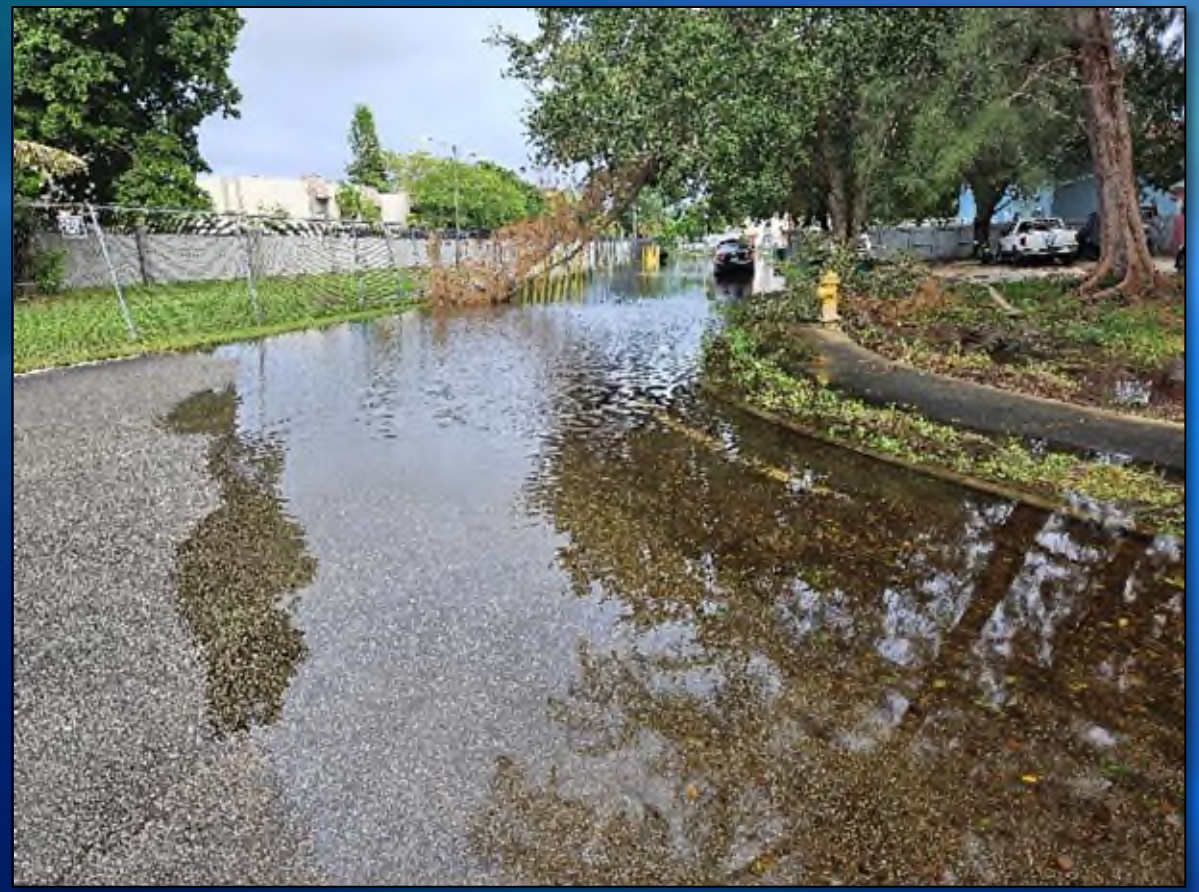
Flooding Or Flood Concern?

Boca Raton, 2025

Flood Concern

While there is little to no visible water, this culvert is considerably blocked and may be cause for concern if heavy rain is forecasted

Flooding Or Flood Concern?



North Miami, 2023

Flooding

Water is in the road and in nearby yards, which is considered active flooding

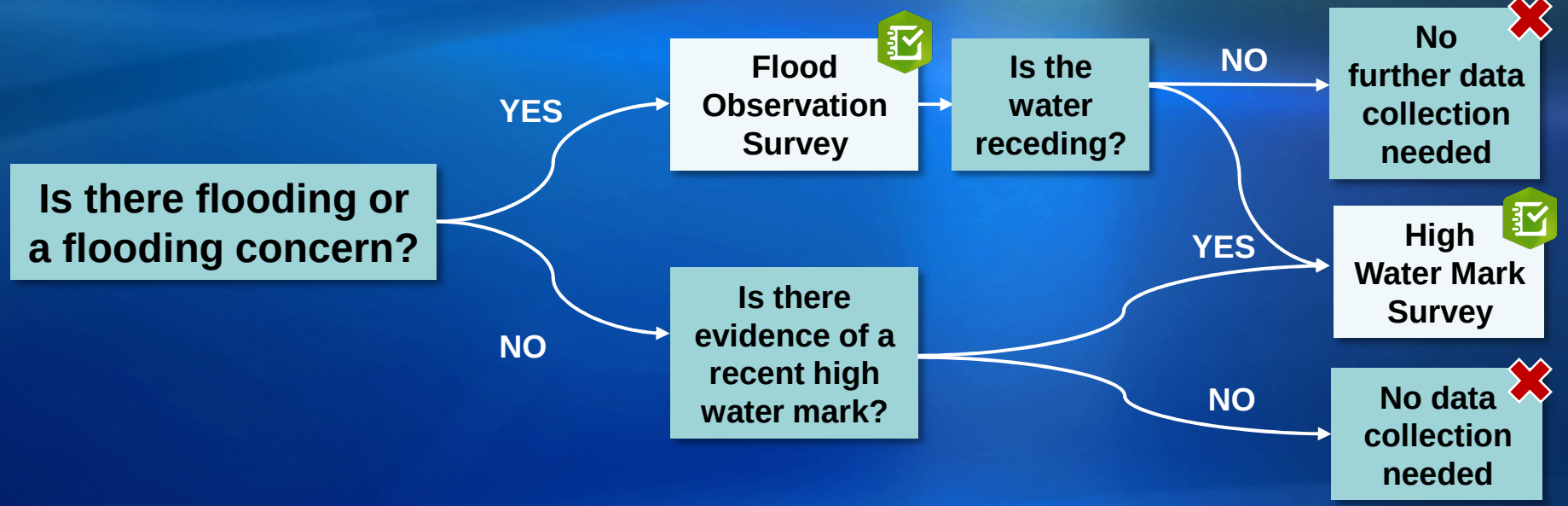
Flooding Or Flood Concern?

North Palm Beach, 2023

Flooding

This is a more complex situation, but this is considered flooding. While the dock is supposed to be *in* the water, water levels have risen high enough that water is going over the top of it, which is not where water is *supposed* to be

Which Survey Should I Use, And When?



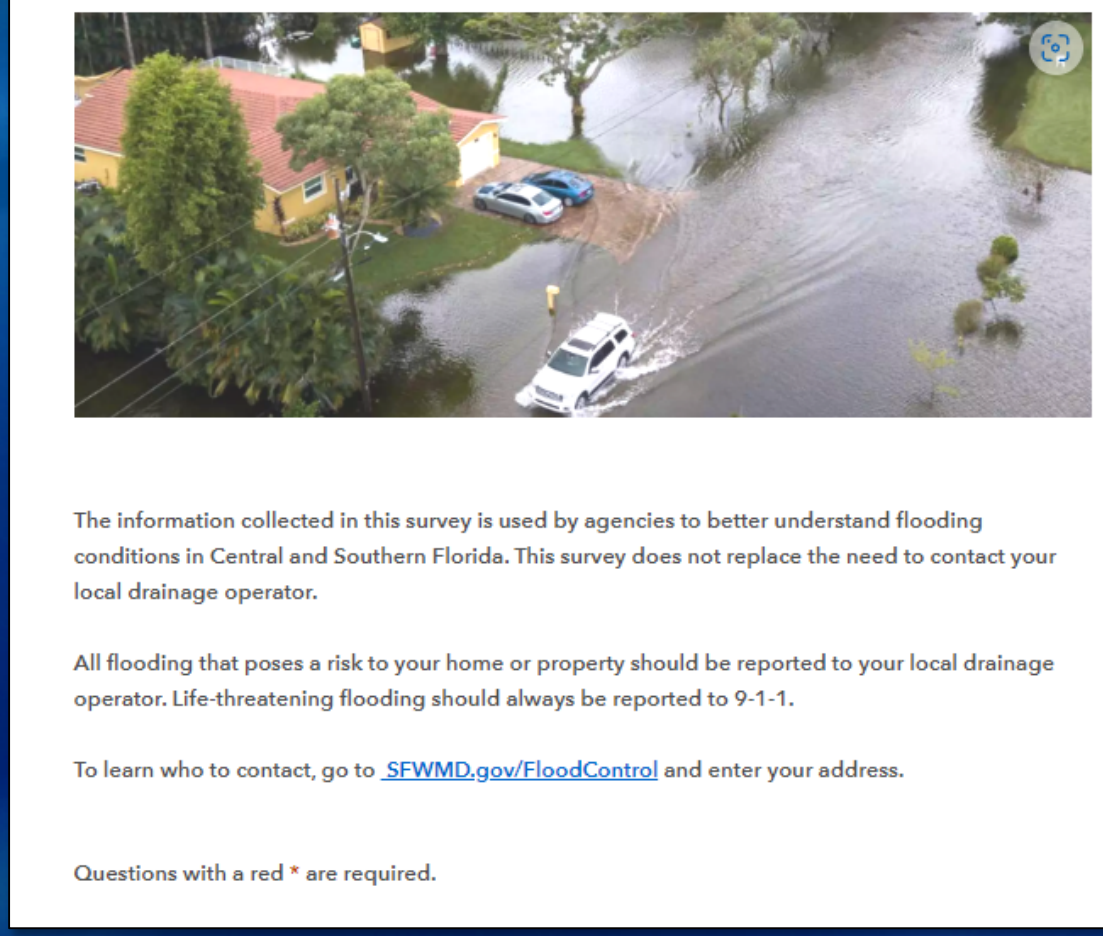
When Do I Submit Data?

- Use the flowcharts to ask yourself questions at each location you visit – even if it's determined that no further data collection is required at a specific location, that does not necessarily mean there are no other instances of flooding nearby
  - Submissions of flooding or flooding concerns need to be observable within the photos and data recorded in the survey at that specific geographic location
- Please continue to visit other locations/areas of interest as possible

Flood Observation Survey

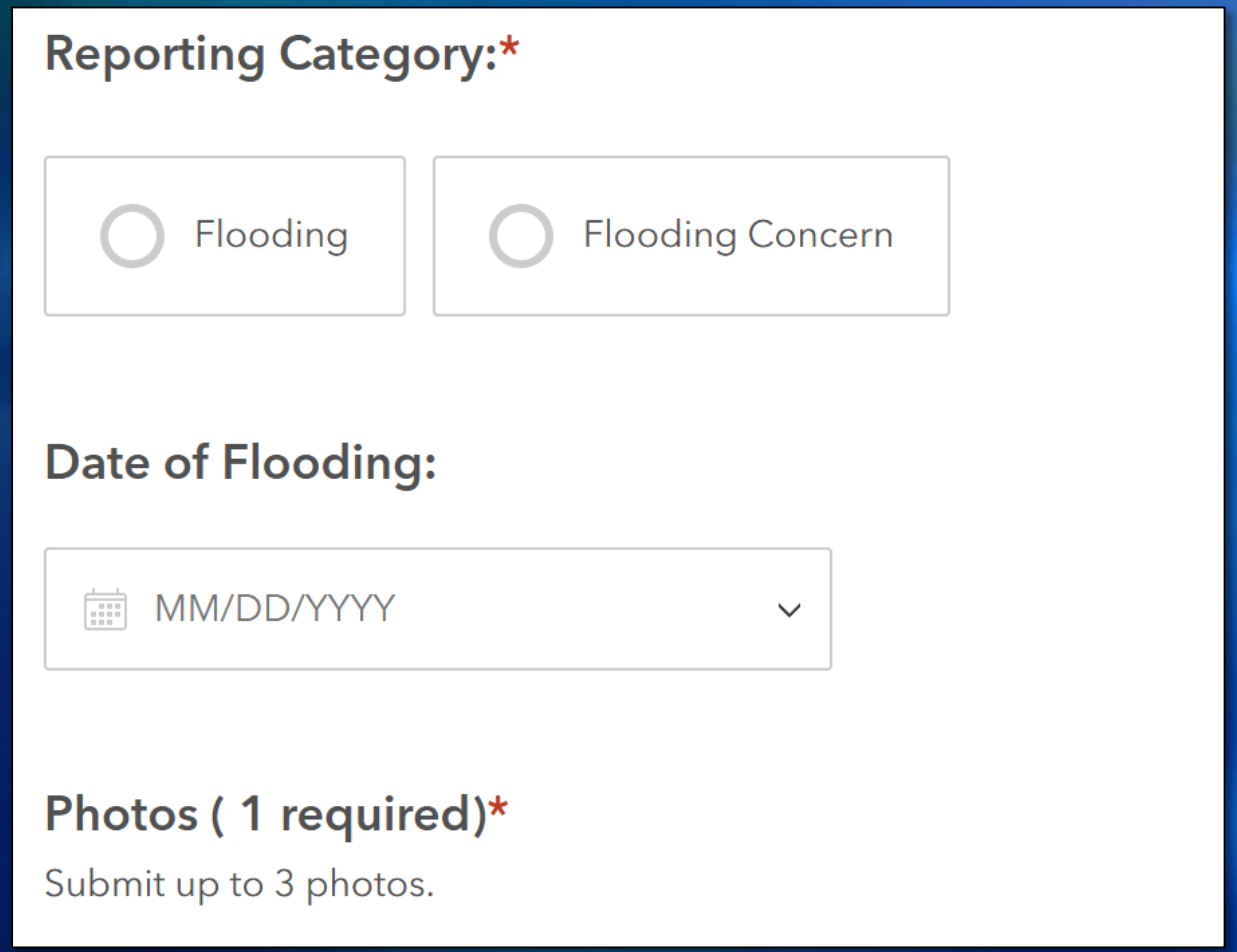
- SFWMD.gov/floodingapp
  - This survey is open to the public and will not require a sign in

Flood Observation Survey



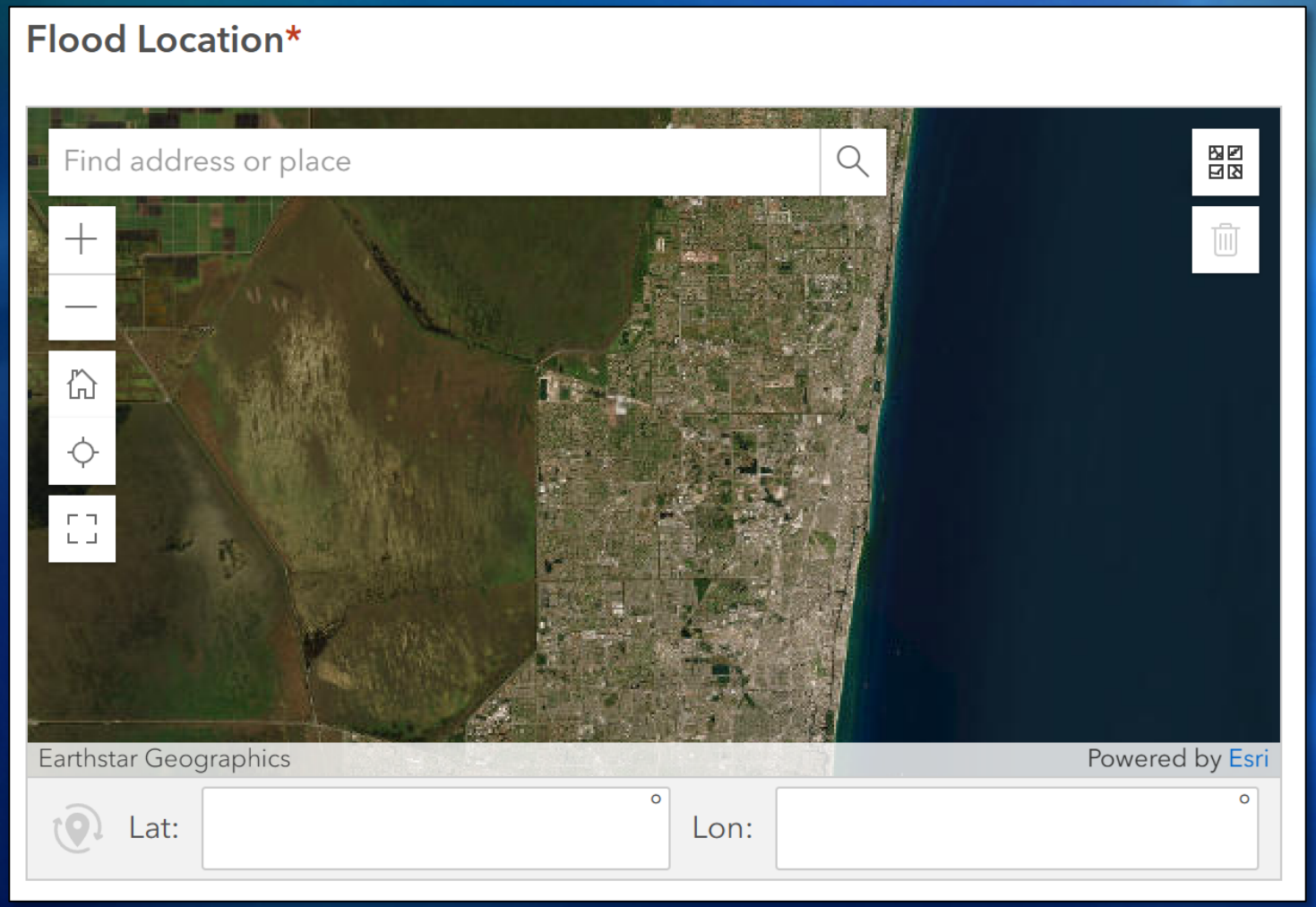
- If you've already submitted or saved data, you may see other options/folders in addition to "Collect" at the bottom of your screen.

Flood Observation Survey



- **Reporting Category**: Flooding or a Flooding Concern
- Date of Flooding
- **Photos** of the flooding or flooding concern (at least one photo is required)
  - For King Tides specifically, take photos upstream and downstream of the structure, and of the water level gauge

Flood Observation Survey

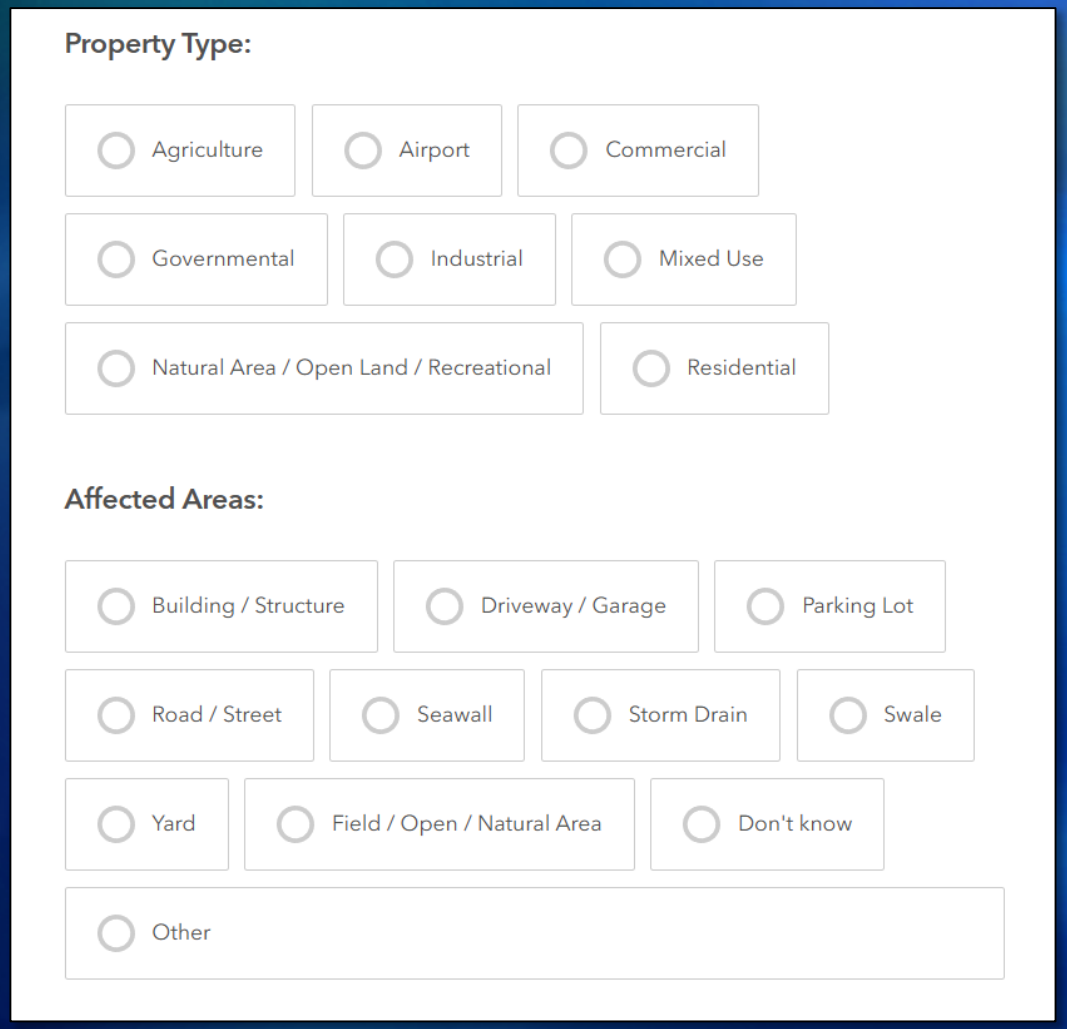


- **Flood location**: choose the location of the flooding on the map
  - Either find an address in the search bar, type in coordinates, use the map to select the location, or select the “find my location” button (under the “home” icon) to zoom to your location

Flood Observation Survey

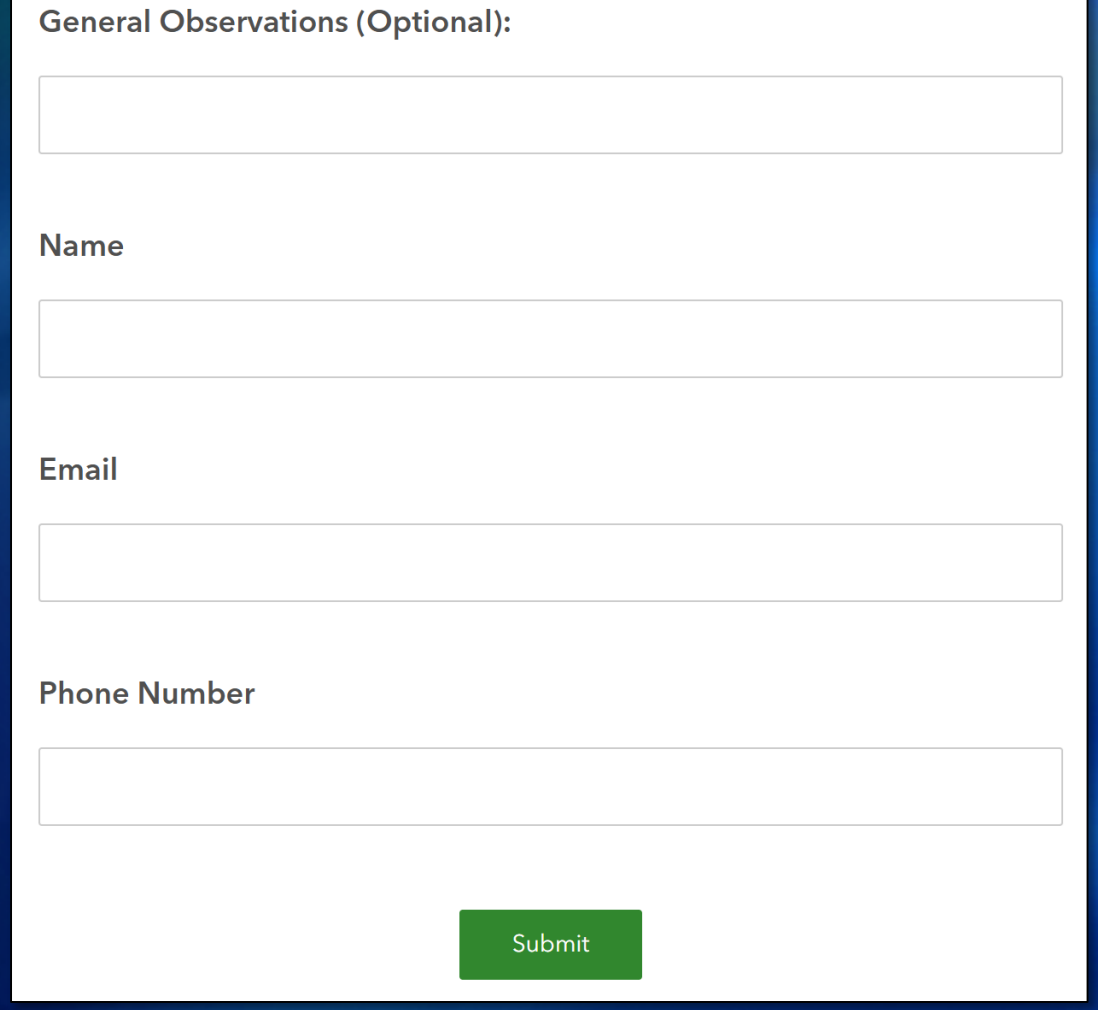
- Select the appropriate button for the water depth and previous flooding information

Flood Observation Survey



- **Property Type: select the type of affected property from the options**
  - Agriculture, Airport, Commercial, Governmental, Industrial, Natural Area/Open Land/Recreational, or Residential
- **Affected areas: choose the option that is representative of the area that has been flooded**
  - Building/Structure, Driveway/Garage, Parking Lot, Road/Street, Seawall, Storm Drain, Swale, Yard, Field/Open/Natural Area, Don't Know, or Other (if other, type in more information)

Flood Observation Survey



- Use the General Observations field to report additional information, explain the flooding situation, share details about the photos or location, etc.
- Enter in Name, Email, and Phone Number

Flood Observation Survey

Questions?

Survey123 Best Practices

- Always send all data as soon as you have an internet connection
  - If the device is damaged, the app is deleted, etc. before the data is sent, it may be completely lost

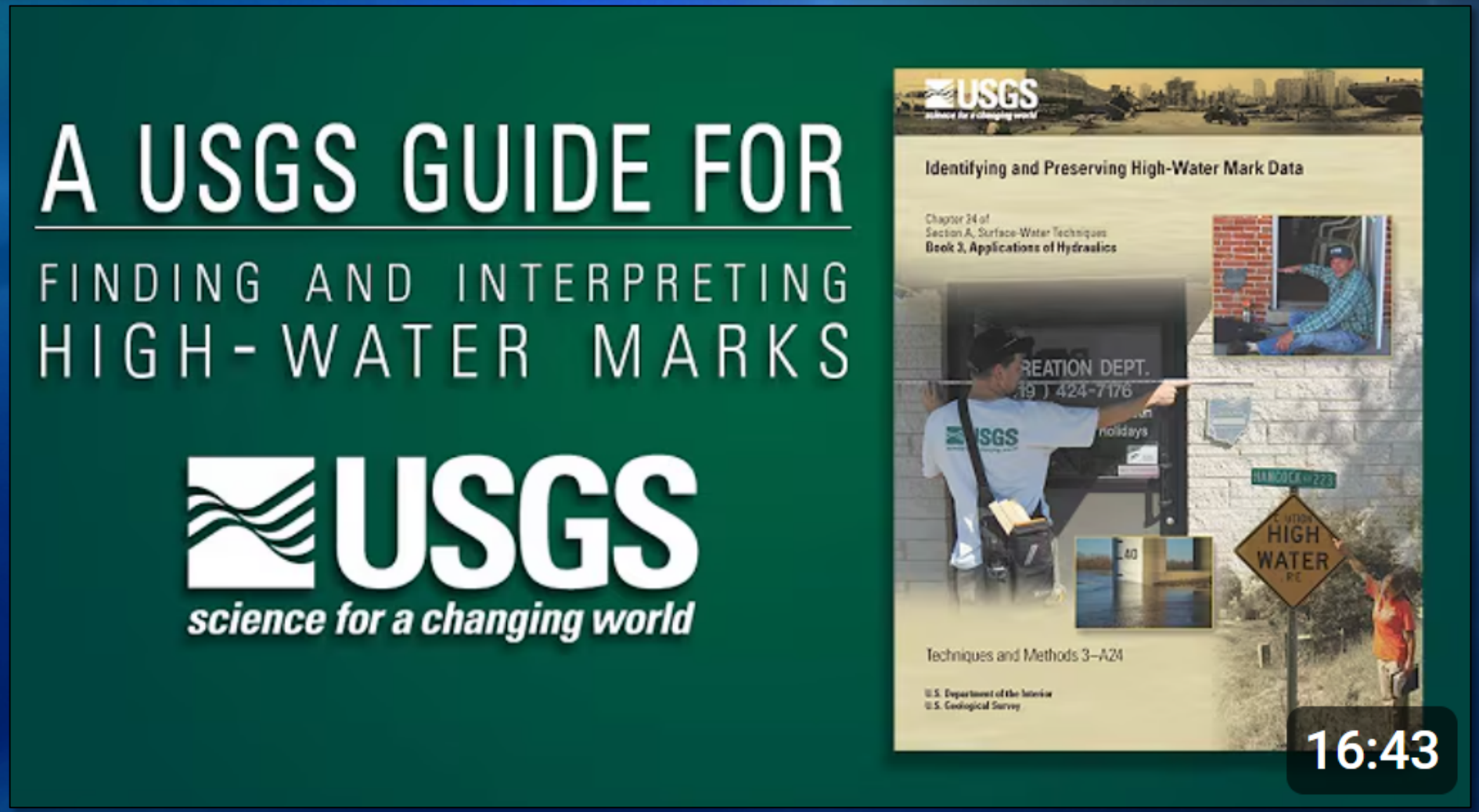
- In addition to the “Collect” button on the bottom of the screen, there may also be a “Drafts,” “Outbox,” and/or “Sent” buttons
  - Incomplete surveys are saved to the Drafts to be finished later
  - Completed surveys that were sent while offline are stored in the Outbox

What Is A High Water Mark?

- A high water mark (HWM) is the highest level reached by water during a flood or tide
- Determined by physical evidence in the form of debris, mud, seed lines, stain lines, or vegetation lines
- Requires identifying, geolocating and often measuring to the ground
- Used to understand flooding extents

Hurricane Ian – September 2022

High Water Mark Guide (Click To Play - Source: USGS)



Source: USGS: *A USGS Guide for Finding and Interpreting High-Water Marks*. Timestamps featured in the training: 0:00-2:00, 4:08-5:50, 14:30-16:05.

Where Is The High Water Mark?

Source: USGS: *A USGS Guide for Finding and Interpreting High-Water Marks*

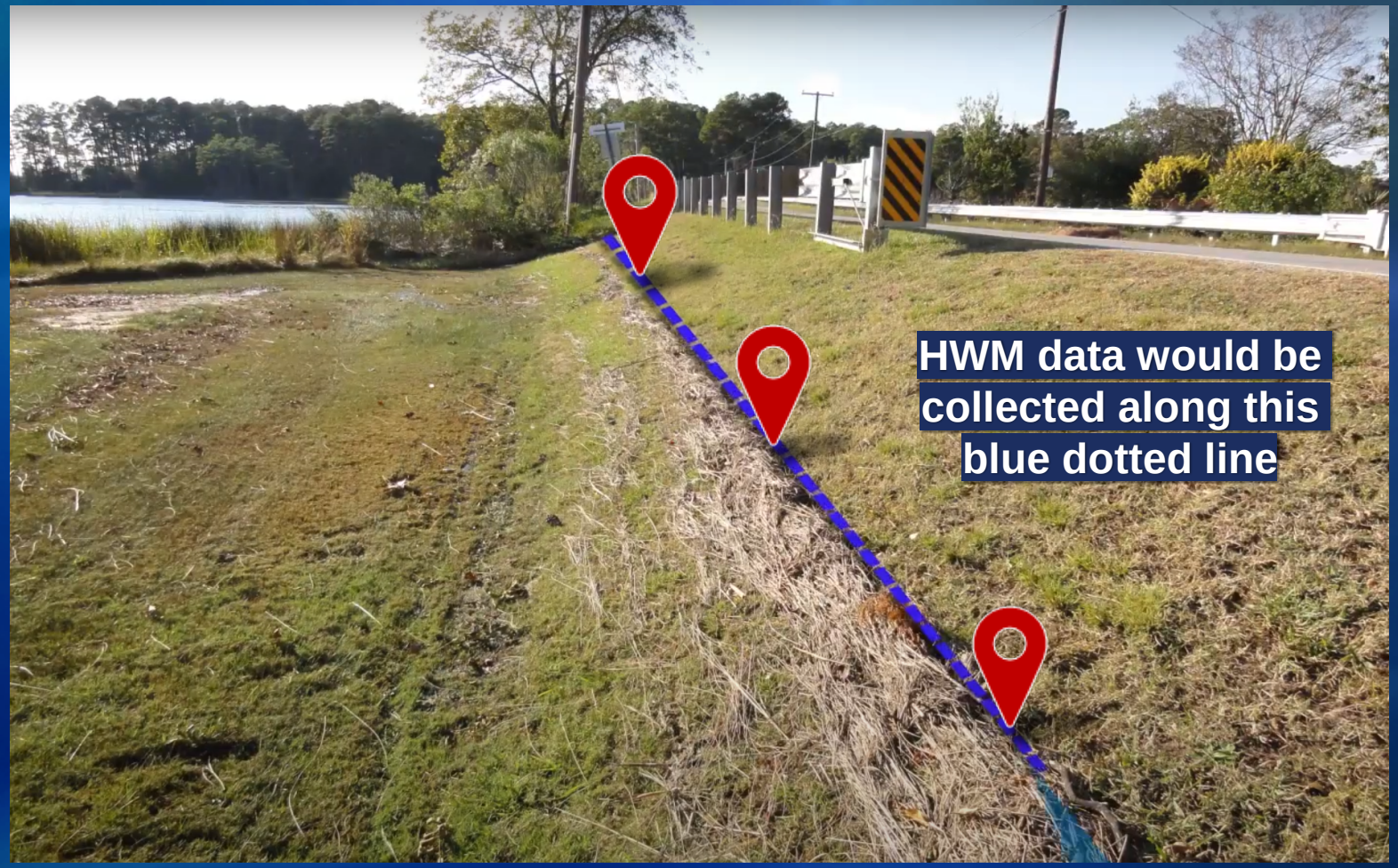
- How to locate?
  1) Scan your surroundings
  2) Visualize the flood by using context clues

Where Is The High Water Mark?

Source: USGS: *A USGS Guide for Finding and Interpreting High-Water Marks*

- This debris line identifies the highest point the water reached during the flooding event and after the water receded

Where Is The High Water Mark?



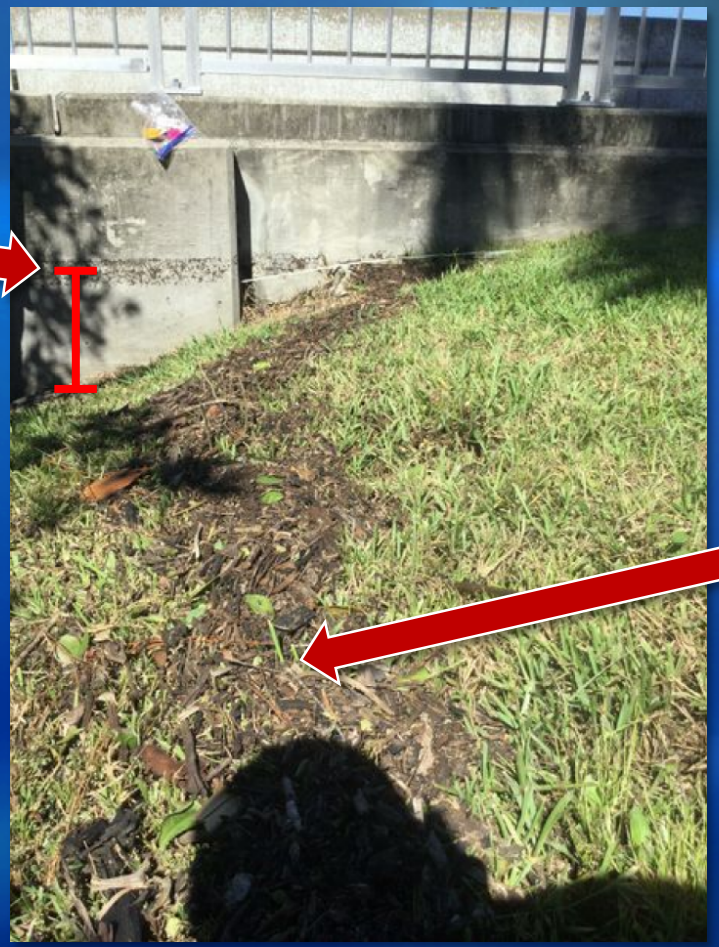
Source: USGS: *A USGS Guide for Finding and Interpreting High-Water Marks*

Where To Collect The High Water Mark?

Where To Collect The High Water Mark?

Height Above Ground Measurements

If you are recording your high water mark based on this wall's seed line, your “height above ground in inches” is the measurement to the ground

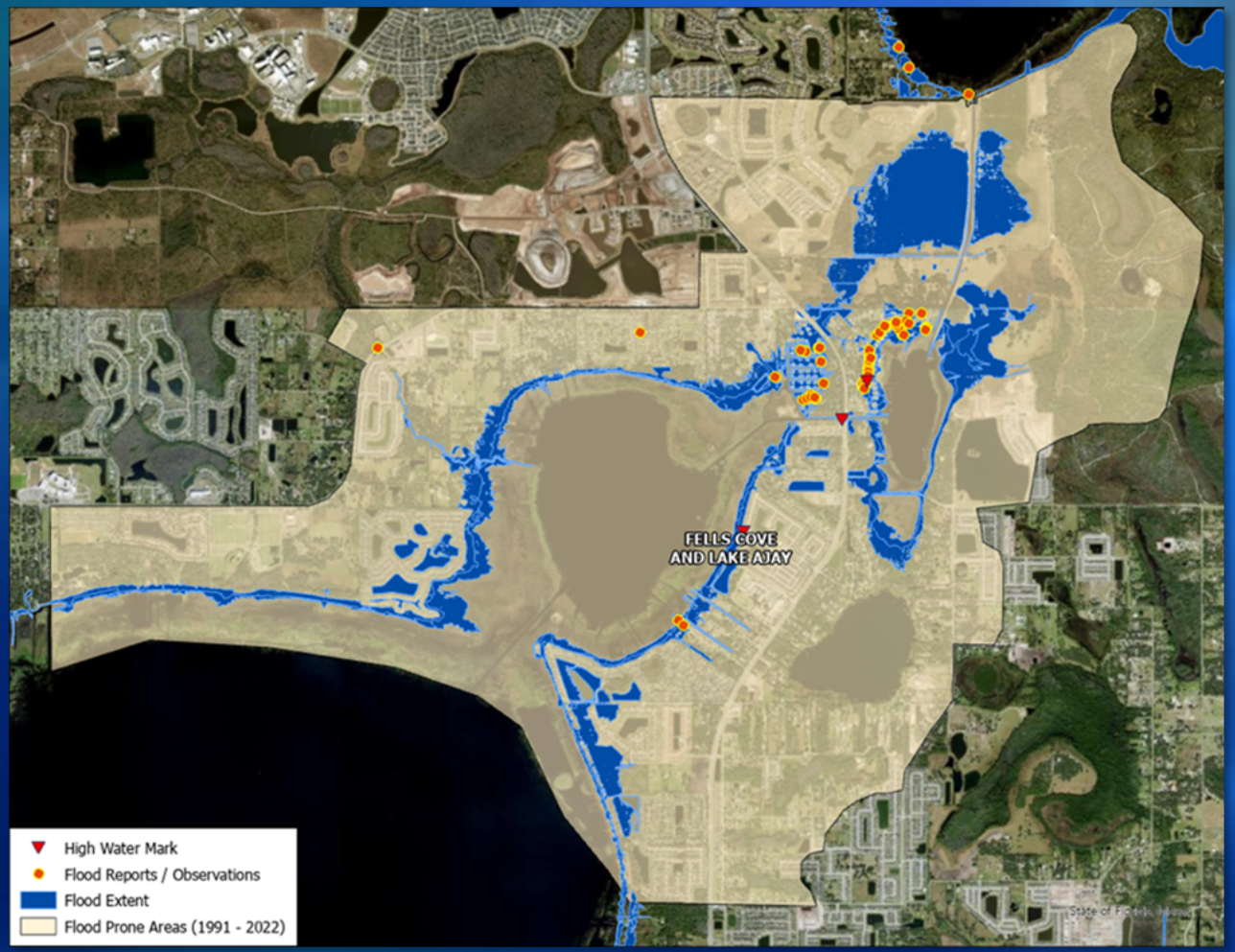


If you are recording your high water mark based on this debris line on the ground, your “height above ground in inches” is 0

High Water Mark Photos

- Placing a High Water Mark tag or ribbon is not required, but does provide helpful context in photos
- Take pictures from different angles and distances
  - Upload up to 3 images
  - Include identifiable topographic features such as landmarks, street signs, etc.

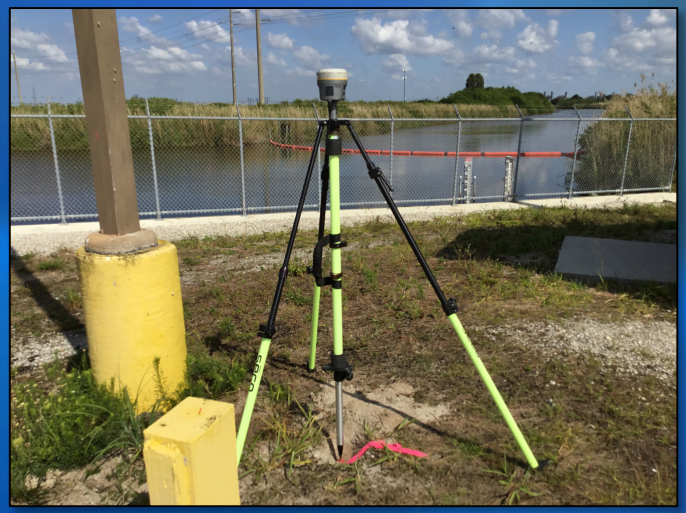
What Does The Data Tell Us?



Hurricane Ian September 2022, East Lake Tohopekaliga / Fells Cove

- High Water Mark data is used to create maps that:
  - Determine flood extents
  - Project flood prone areas

Best Practices – IMPORTANT!



- By using your geolocation and "height above ground" measurement, surveyors are able to derive the elevation of your high water mark location
- When collecting the location of your high water mark in the application, <u>always be as close as possible to the actual high water mark</u>
  - This is the location that is used in data analysis – representing the high water mark as elsewhere (ex: from your vehicle, back in the office, or even a few feet away from the actual high water mark, etc.) can lead to misinterpretation of the results and/or inaccurate conclusions about the flooding event.

High Water Mark Survey

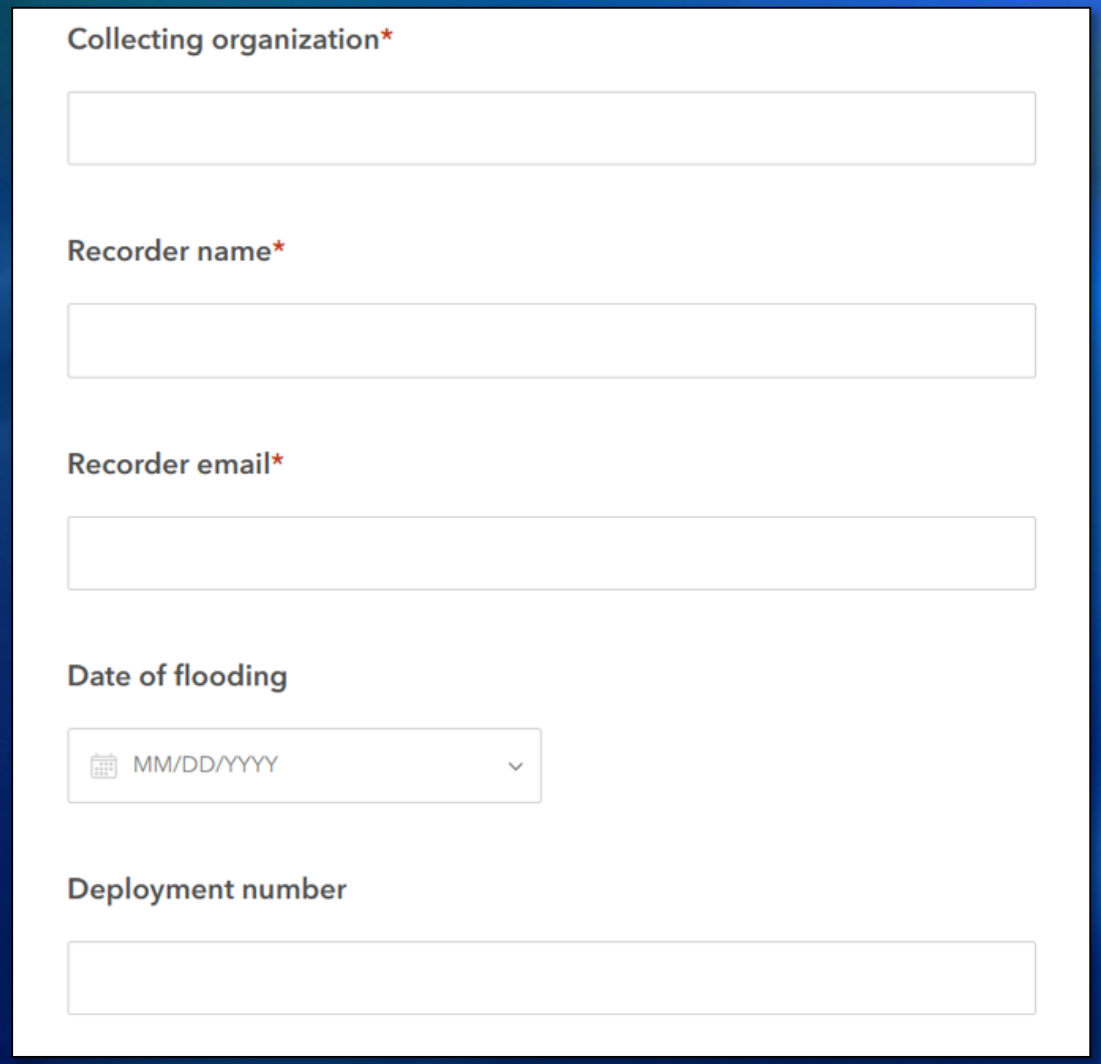
- SFWMD HWM Survey (arcgis.com)
  - You will need to sign into the Survey123 application in order to collect data in this survey beyond the training period
  - Do not expose yourself to any risk of harm while conducting this survey

High Water Mark Survey

SFWMD HWM Survey

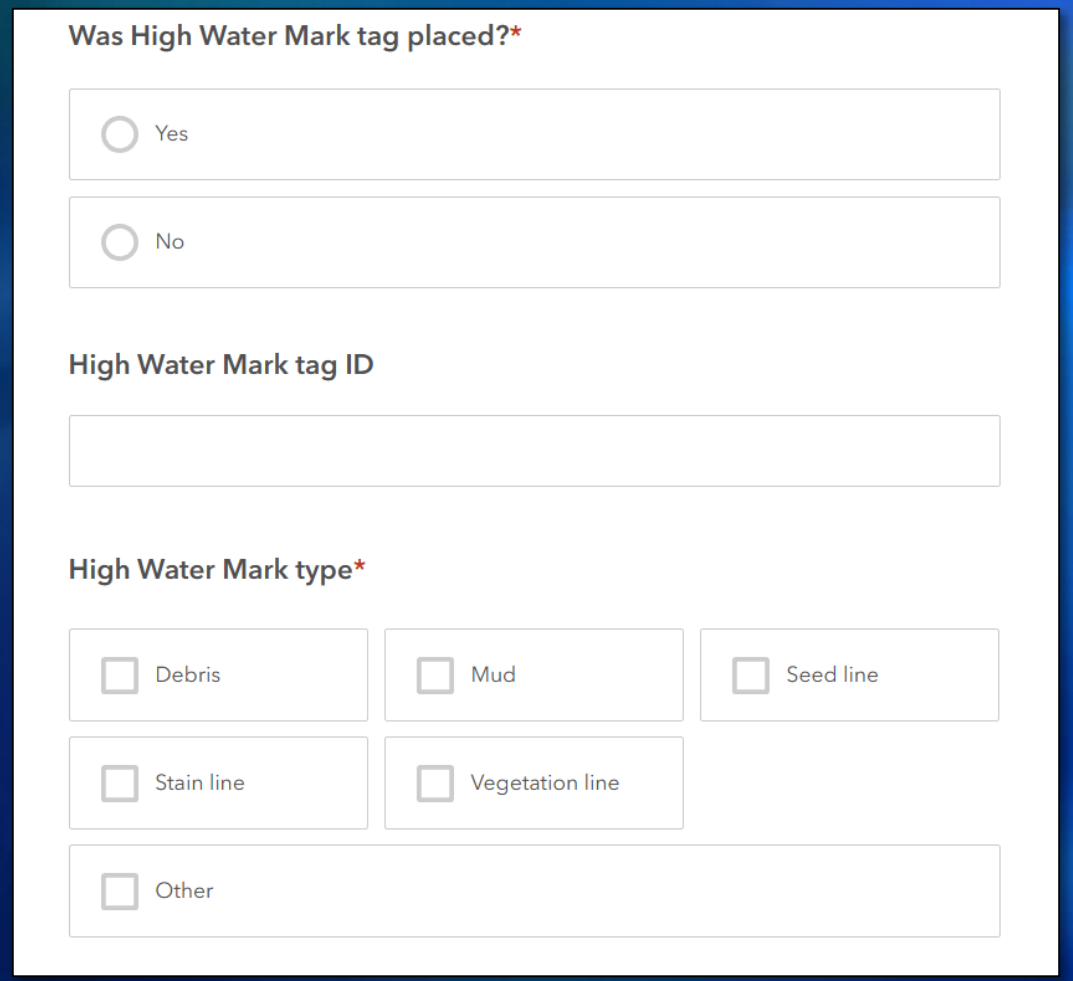
Questions with a red * are required.

High Water Mark Survey



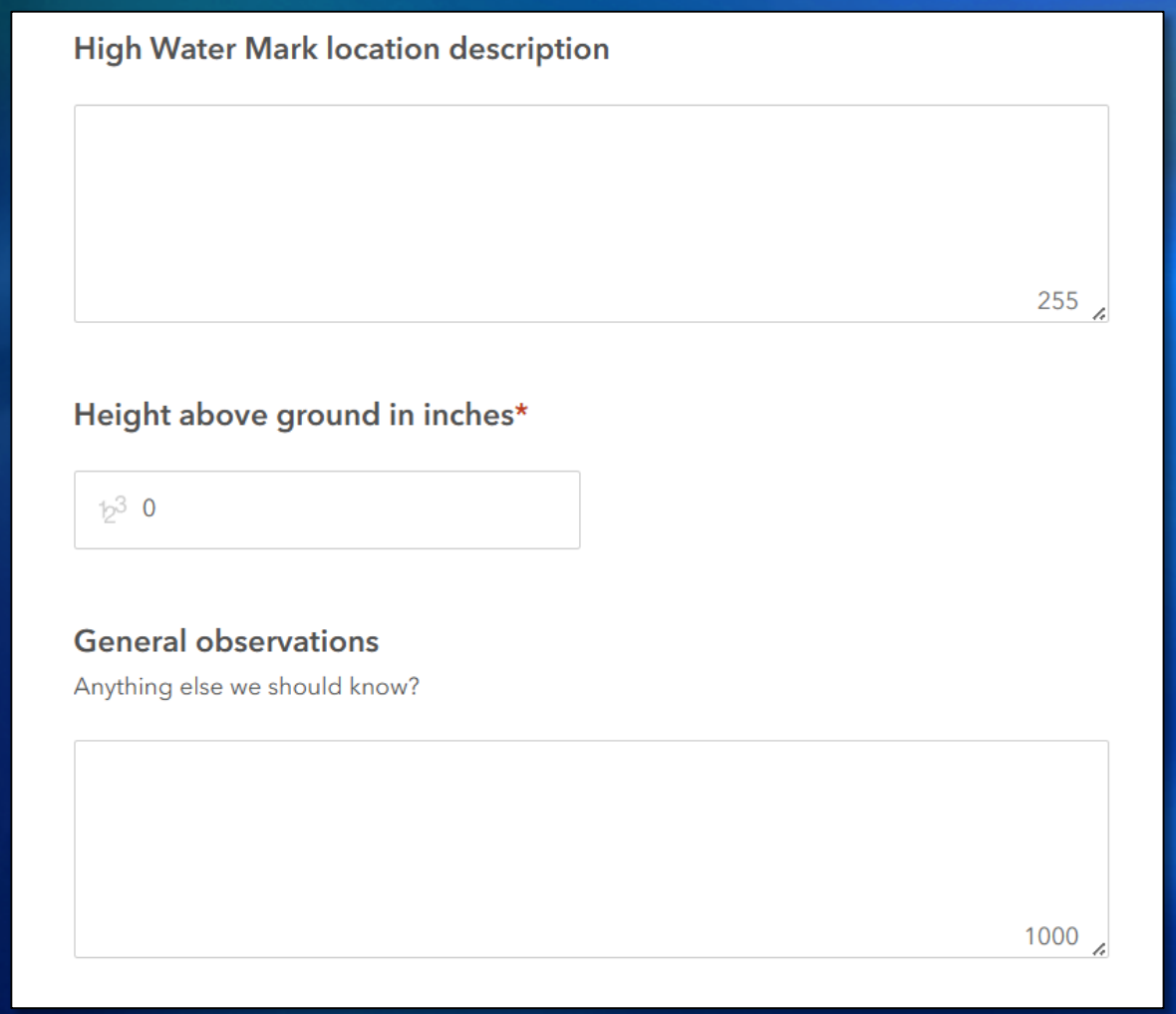
- **Collecting organization**: SFWMD, or your organization
- **Recorder name**: your name
- **Recorder email**: your email
- Date of flooding
- Deployment number: this number will be given to you if it is needed (SFWMD staff)

High Water Mark Survey



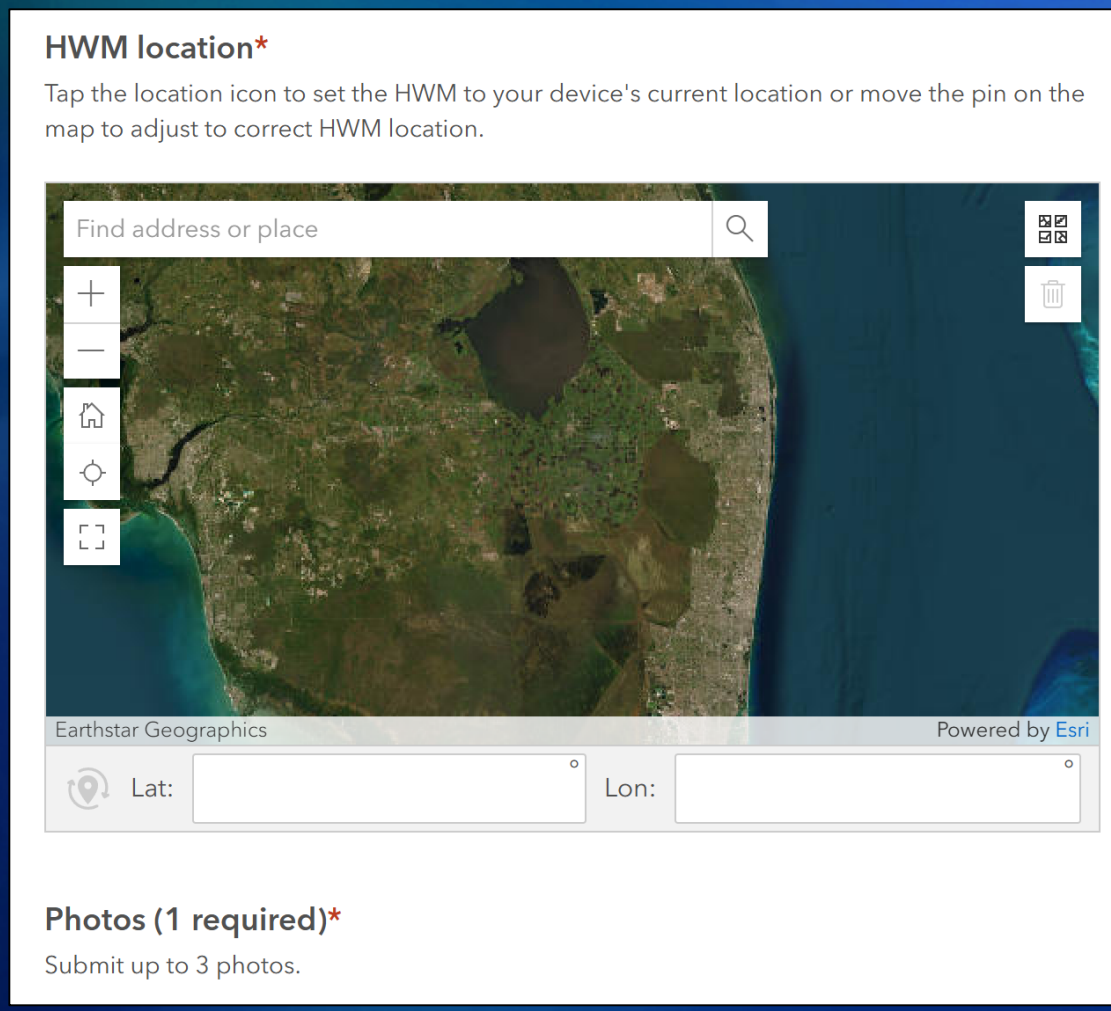
- Check **yes or no** if there was a tag placed on the high water mark
- High Water Mark tag ID: the ID/number on the tag, if the tag was placed
- **High Water Mark type**: Select the type of high water mark indicator that was used to identify the high water mark, from the options: debris, mud, seed line, stain line, vegetation line, or other
  - If other, type in more information

High Water Mark Survey



- High Water Mark location description: include other details about where the high water mark can be found
- Height above ground in inches: the height of the high water mark off of the ground – Default is set to 0 to represent that the mark is on the ground
- General observations: other information about observed flooding and/or conditions

High Water Mark Survey



- **HWM location**: choose the location of the flooding on the map
  - Either find an address in the search bar, type in coordinates, use the map to select the location, or select the “find my location” button (under the “home” icon) to zoom to your location
- **Photos**: submit at least one photo of the high water mark, additional photos can be included to help provide location information/context or High Water Mark details

High Water Mark Survey

Questions?

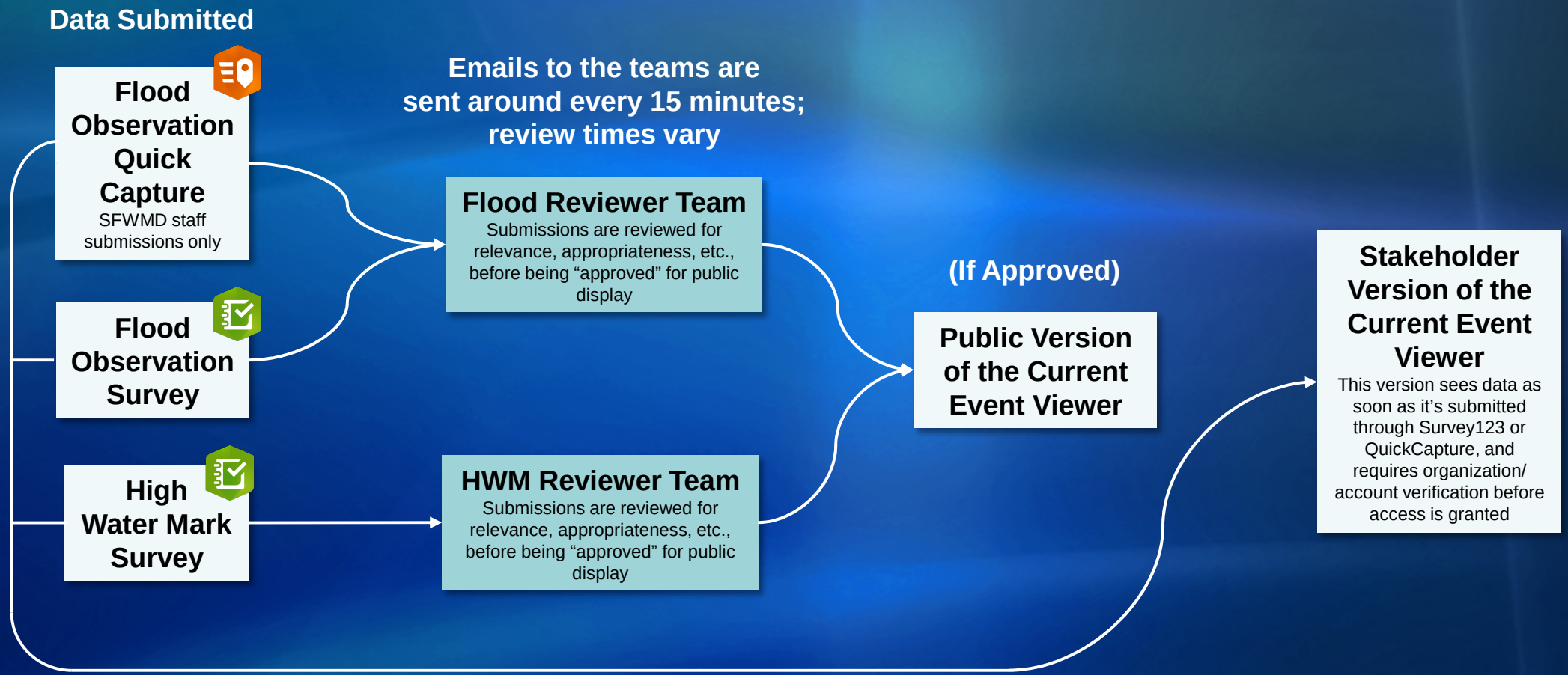
Questions & Support

- If you have any questions that come up regarding any of the materials we've gone over today, please feel free to reach out via email:
- Geospatial Services & High Water Mark Team
  - SFWMD_HWM@sfwmd.gov
- Flood Reviewer Team
  - FloodReportReviewers@sfwmd.gov

Testing Exercise

- Please take at least one collection in Survey123 before leaving today
  - Please include “TEST” somewhere within the surveys if possible (ex: in the Comments or Observations field)
  - Test points will be deleted once the trainings are completed
- Please return to the room after collecting data

Data Submission & Review Process



SFWMD Geospatial Resources

- South Florida Flood Information Resource
- | South Florida Water Management District (sfwmd.gov)
  - Geospatial/Geographic Information Systems (GIS) | South Florida Water Management District (sfwmd.gov)

SFWMD Geospatial/ Geographic Information Systems (GIS)

Thank You!

Geospatial Services & High Water Mark Team: SFWMD_HWM@sfwmd.gov

Flood Reviewer Team: FloodReportReviewers@sfwmd.gov