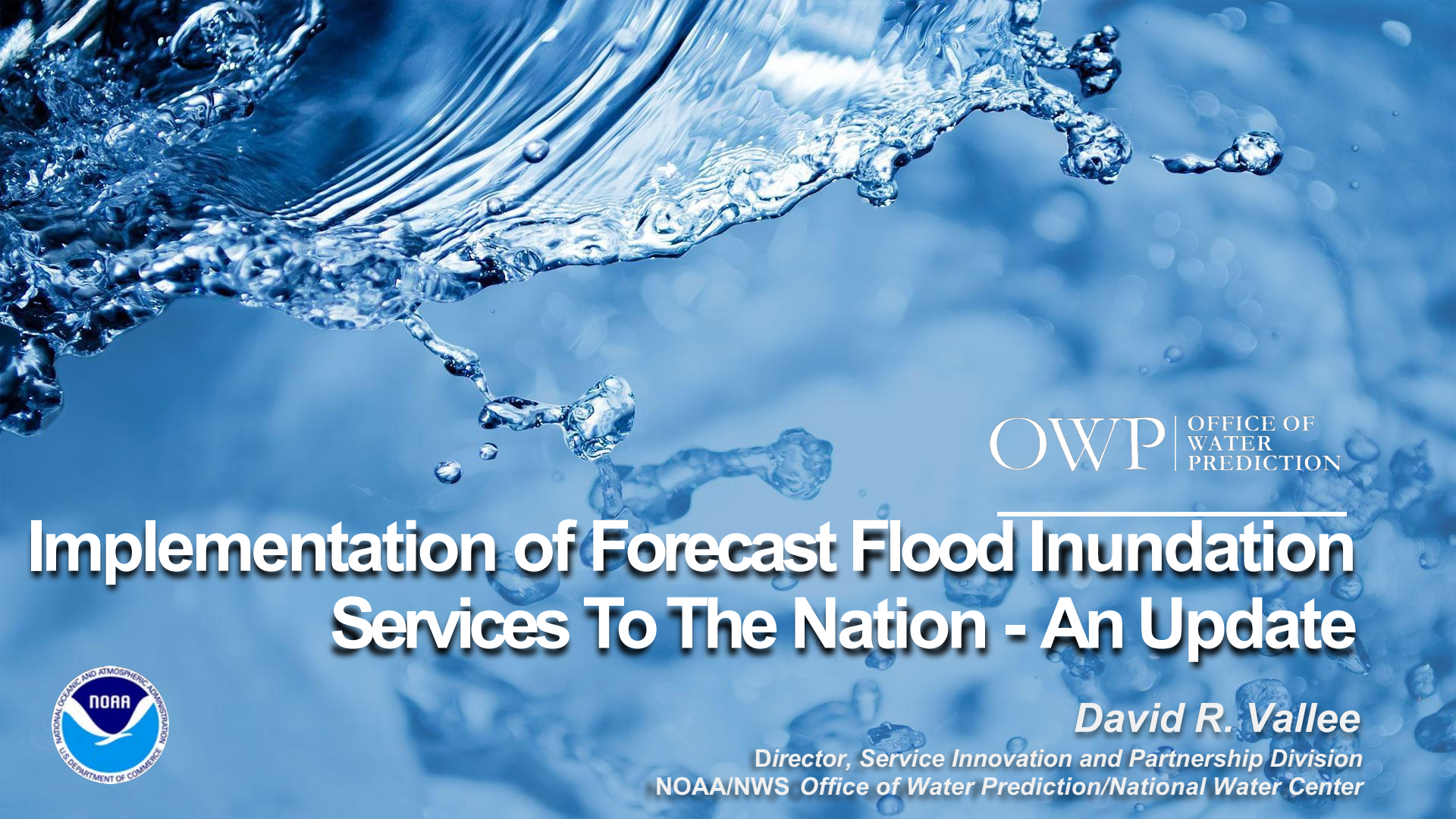


OWP | OFFICE OF WATER PREDICTION

Implementation of Forecast Flood Inundation Services To The Nation - An Update

David R. Vallee

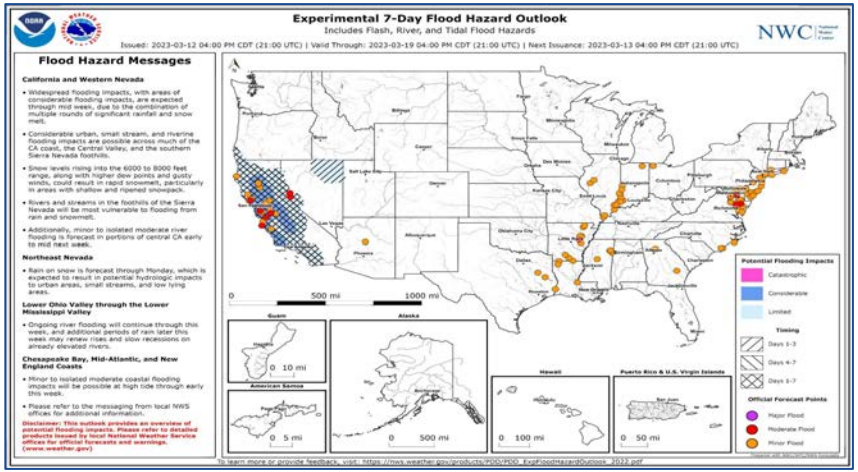
Director, Service Innovation and Partnership Division

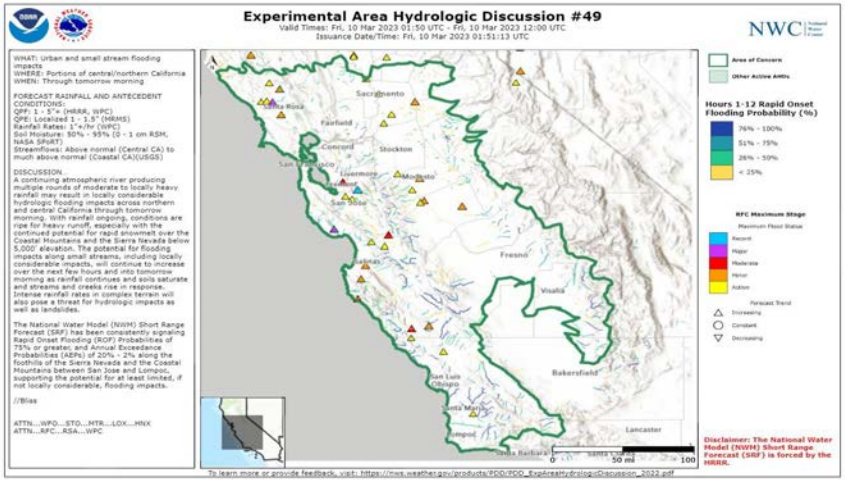
NOAA/NWS Office of Water Prediction/National Water Center

Outline for this session

- The Latest on NWC/WPOD Experimental Services
- Introducing our new National Water Prediction Service!!! (formally known as AHPS)
- FIM Rollout - an update on our progress

Experimental Products & Services





National Water Center Products and Services

Operational and Experimental

Office of Water Prediction
National Program

Weather.gov > Office of Water Prediction > National Water Center Products and Services

https://www.weather.gov/owp/operations

NWC

!NEW! - National Water Prediction Service (NWPS) - !NEW!

On March 27, 2024, the National Water Prediction Service (NWPS) website hosted at https://water.noaa.gov was launched replacing the legacy Advanced Hydrologic Prediction Service (AHPS) page previously located at https://water.weather.gov. Resources and more information are listed below.

Public Notification Statement: November 16, 2023
Service Change Notice (SCN):January 12, 2024
SCN: March 6, 2024

NWPS Flyer
NWPS API Flyer
NWPS Fact Sheet
NWPS Overview (Story Map)
NWPS Product and User Guide
Recording of NWPS Partner Webinar
Recording of NWPS API Webinar
Service Description Document (SDD)

Contact: nwps.webmaster@noaa.gov

Flood Inundation Mapping (FIM) Services

Experimental services depicting the extent of predicted inundation, as derived from River Forecast Center forecasts and National Water Model analyses and forecasts. Services are available via the "viewer", or directly via URLs hosted on the Hydrologic Visualization and Inundation Services (HydroVIS) cloud system. These services are currently only available for an area that includes 10% of the U.S. population but will be expanded later. Additional informational resources are available below.

Public Notification Statement (PNS)
FIM Fact Sheet
Frequently Asked Questions (FAQs)
FIM Service Description Document (SDD)
Viewer Access Instructions
API Access Instructions

CLICK HERE to Provide Feedback

Area Hydrologic Discussion

Experimental short range, episodic, discussion and graphic which highlights locations across the nation that may be impacted by rapid-onset flooding, using National Water Model and other guidance.

AHD Product Description Document
Provide Feedback on AHD
AHD One-Pager

Flood Hazard Outlook

High Level graphical depiction and key messages highlighting the potential threat of inland flood hazards (flash, urban, small stream and riverine) and their associated impacts (catastrophic, considerable, and limited) for the next seven days.

FHO Product Description Document
Provide Feedback on FHO
FHO One-Pager

National Hydrologic Discussion

Experimental discussion of the current and forecast hydrologic conditions across the nation, including a variety of short and medium range (Days 1-10) observed and modeled hydrologic guidance.

NHD Product Description Document
Provide Feedback on NHD
NHD One-Pager

Significant River Flood Outlook

Operational flood outlook intended to provide a general outlook for significant (moderate and above) river flooding. It is not intended to depict all areas of minor flooding or small-scale events such as localized flooding and/or flash flooding.

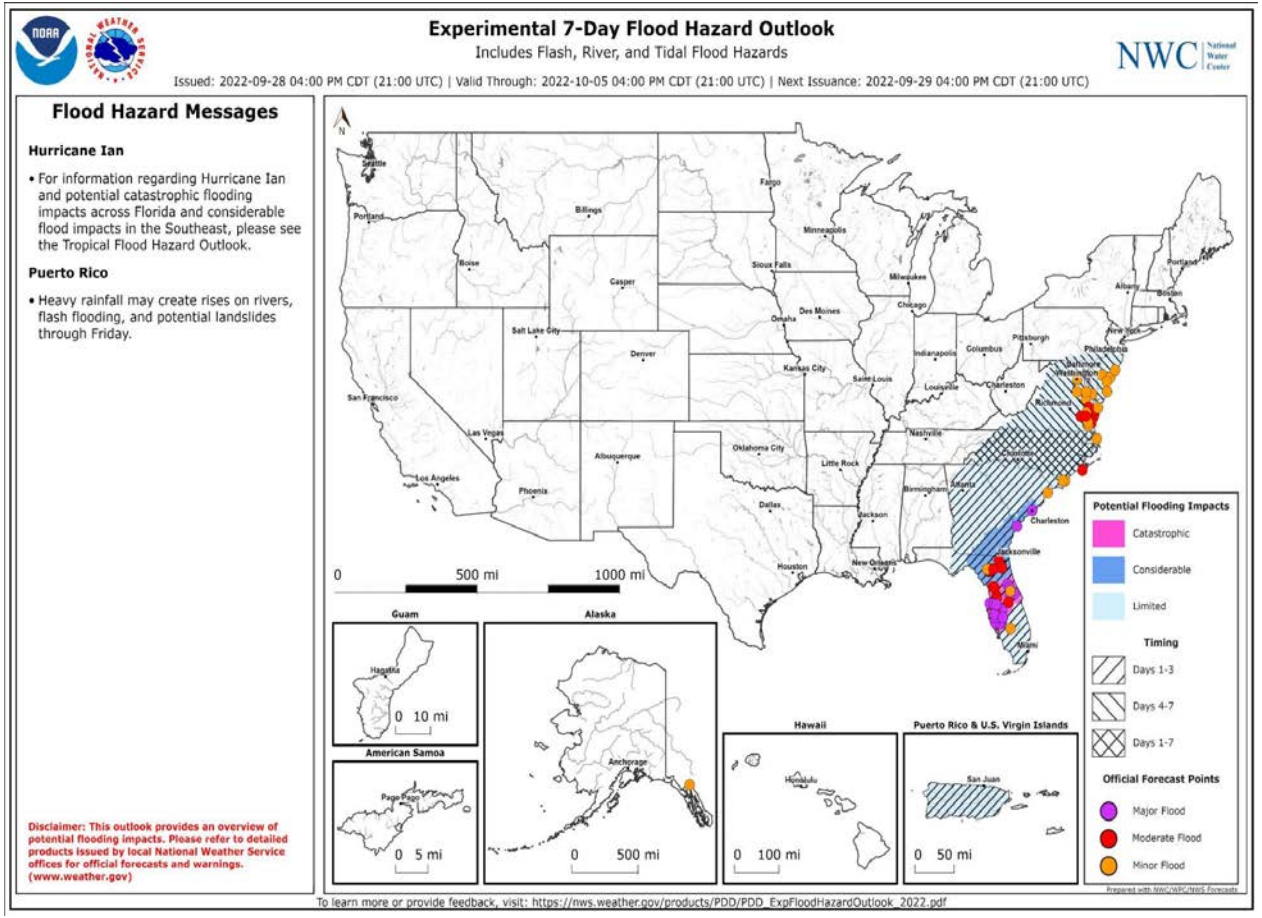
NWC Visualization Services

Experimental geospatial services depicting forecasts from the River Forecast Centers and the National Water Model. Services available via the prototype NWS National Map Viewer, or directly via URLs hosted on the Hydrologic Visualization and Inundation Services (HydroVIS) cloud resource.

Public Services Handbook

FHO

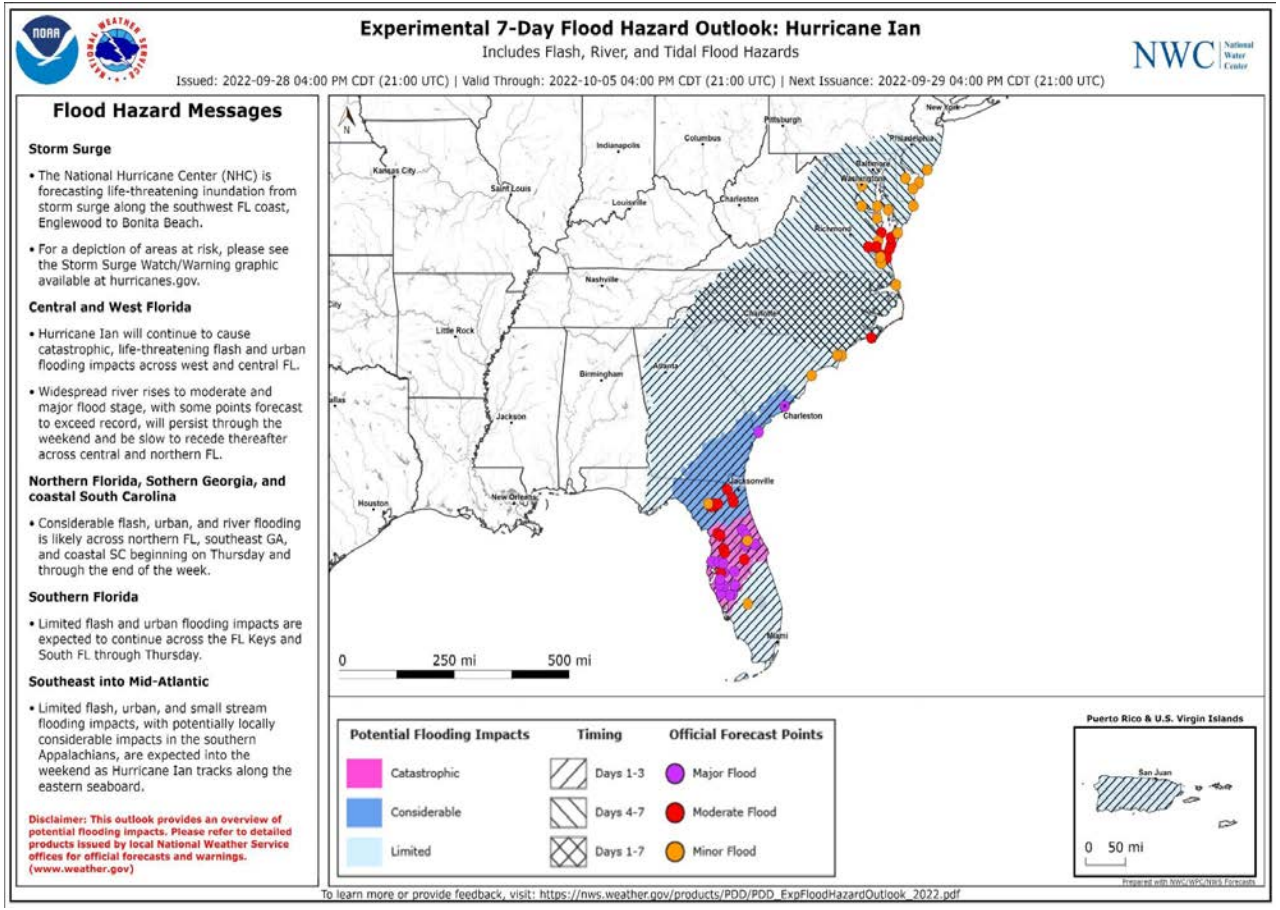
- High Level
- Heads-up
- 7-Day Outlook
- Comprehensive
- 3 Categories
- 3 Timing Bins
- 2xday @7 AM and 4 PM CT
- Static Map
- Map Service
- Archive



https://www.weather.gov/owp/operations-fho

Tropical FHO

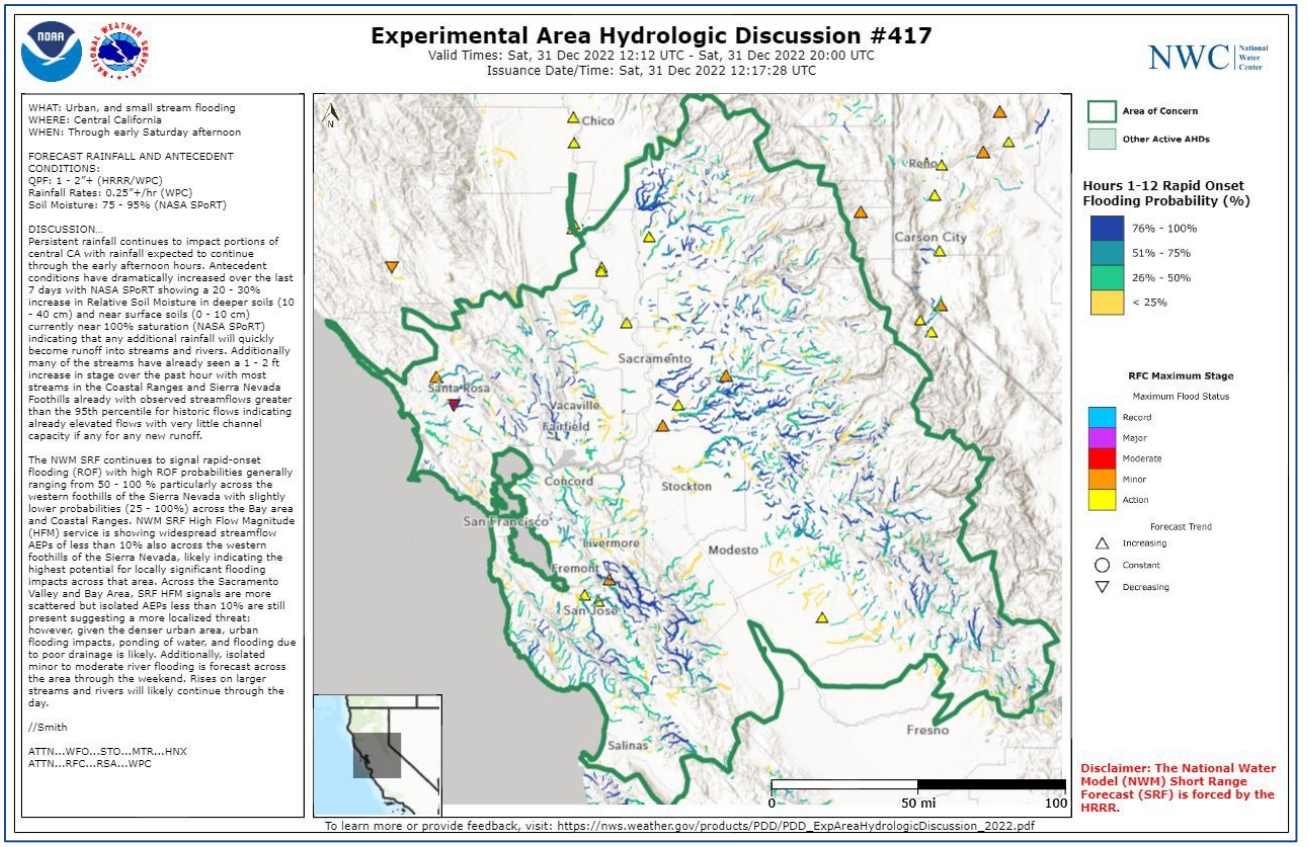
- More focused text
- 2x day
  - @7 AM CT
  - @4 PM CT
- Static Map
- Map Service



https://www.weather.gov/owp/operations-fho

AHD

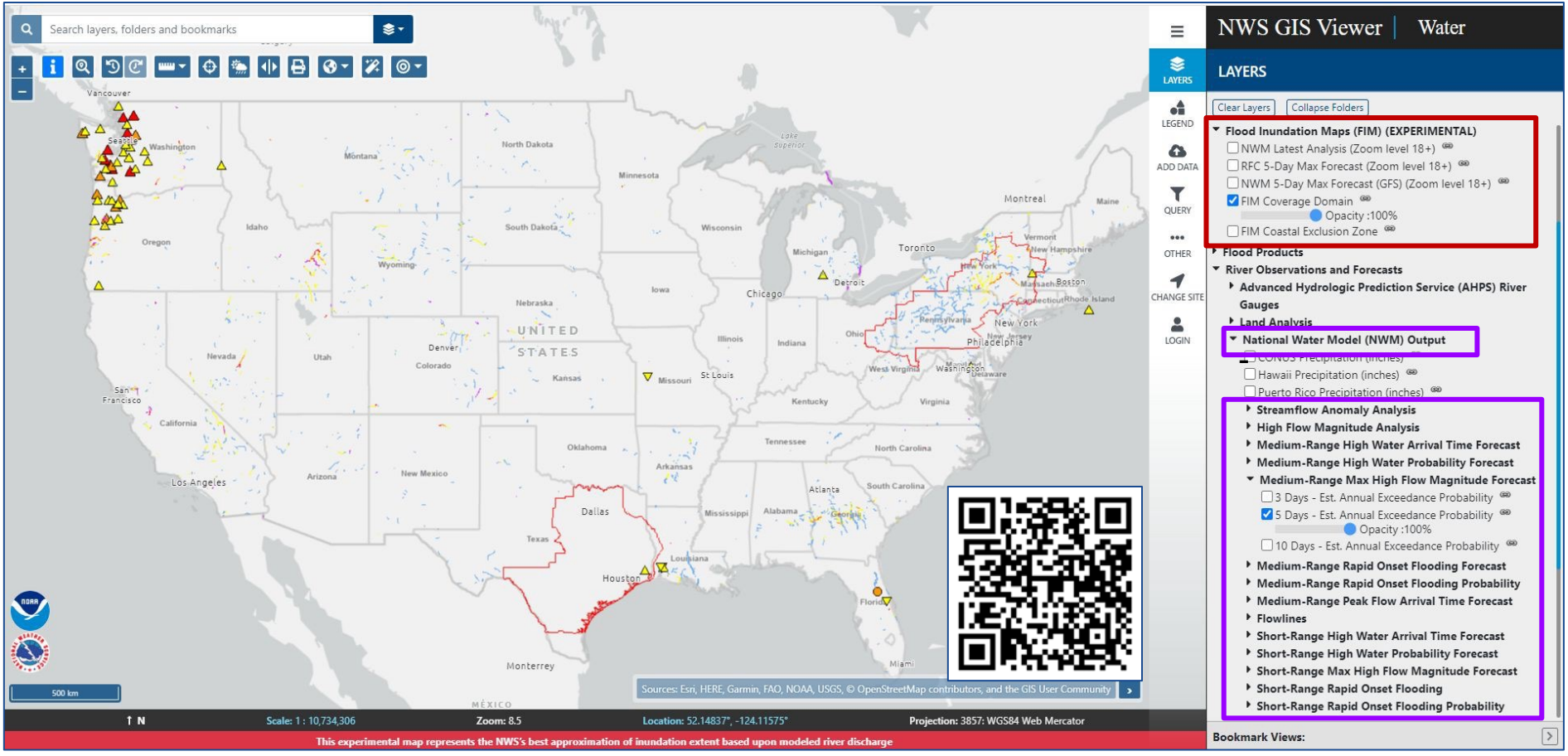
- Episodic
- 2-6 hrs
- Rapid-onset Flooding
- Flash
- Urban
- Small Stream
- WPC Coordination
- Inform WFO Warning Workflow
- PIL: AHDNWC
- Archive



https://www.weather.gov/owp/operations-ahd

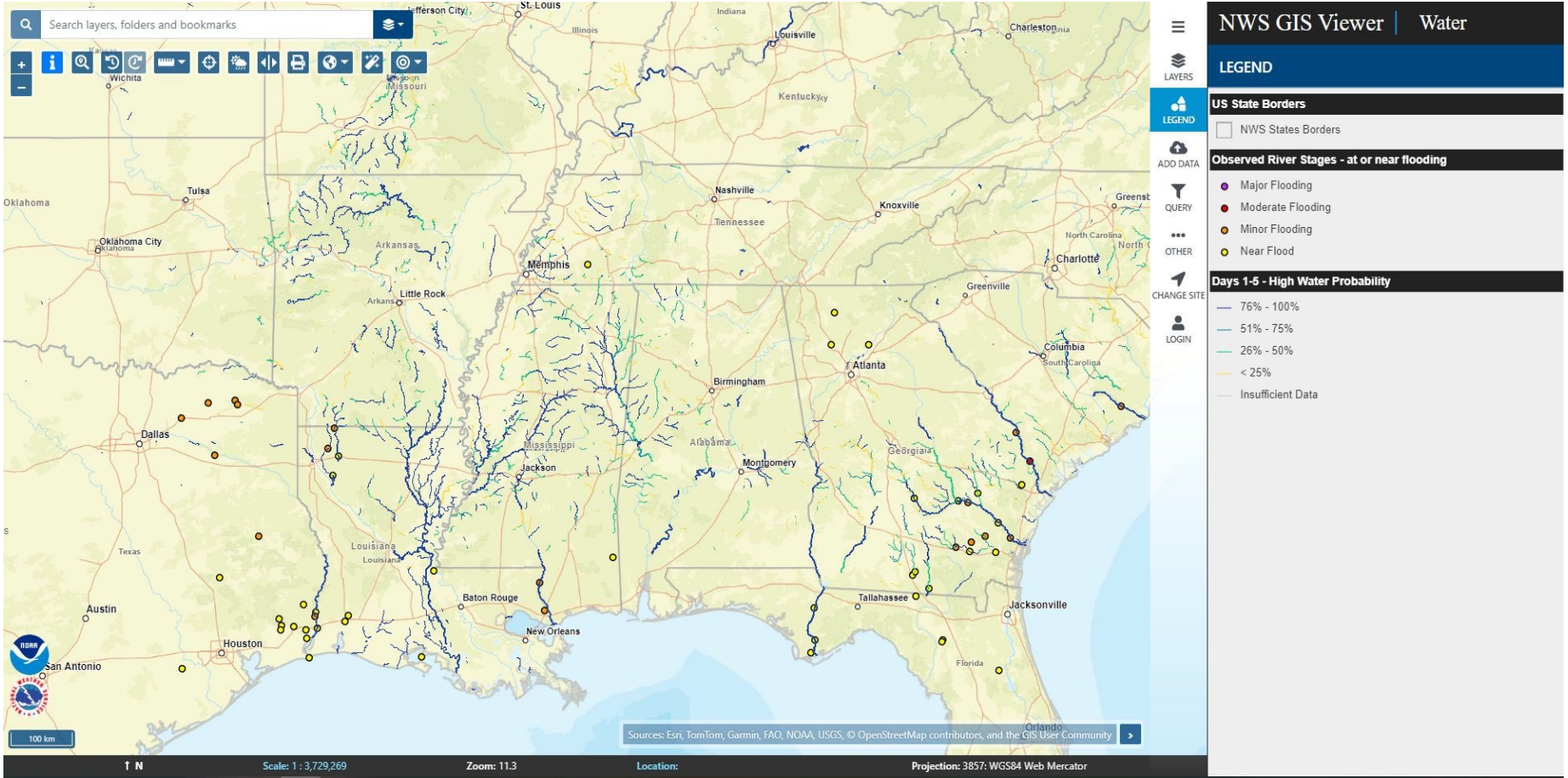
NWM and FIM Services - NWS National Viewer

https://https://viewer.weather.noaa.gov/water



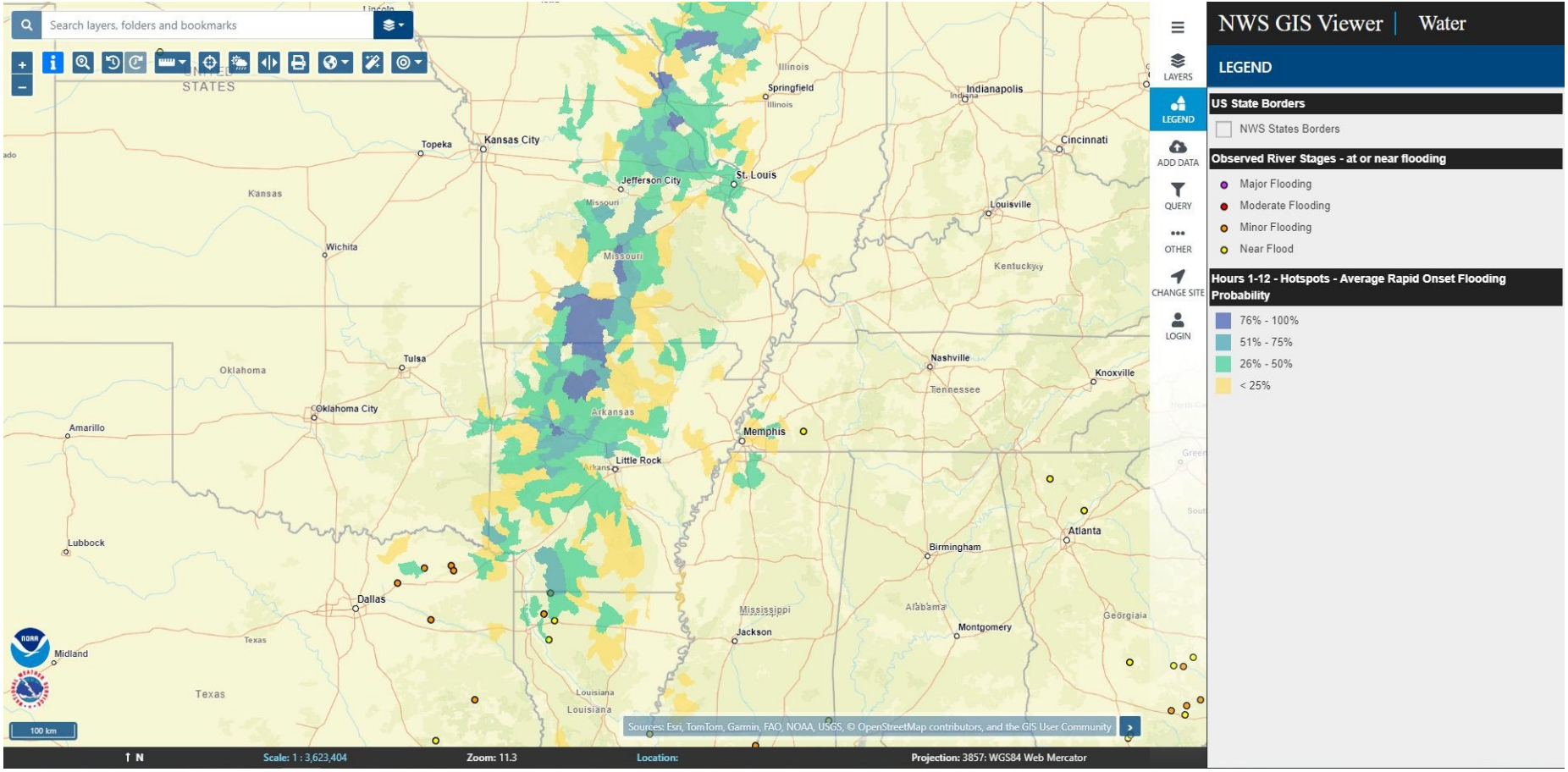
National Water Model Visualizations:

High Water Probability Forecast



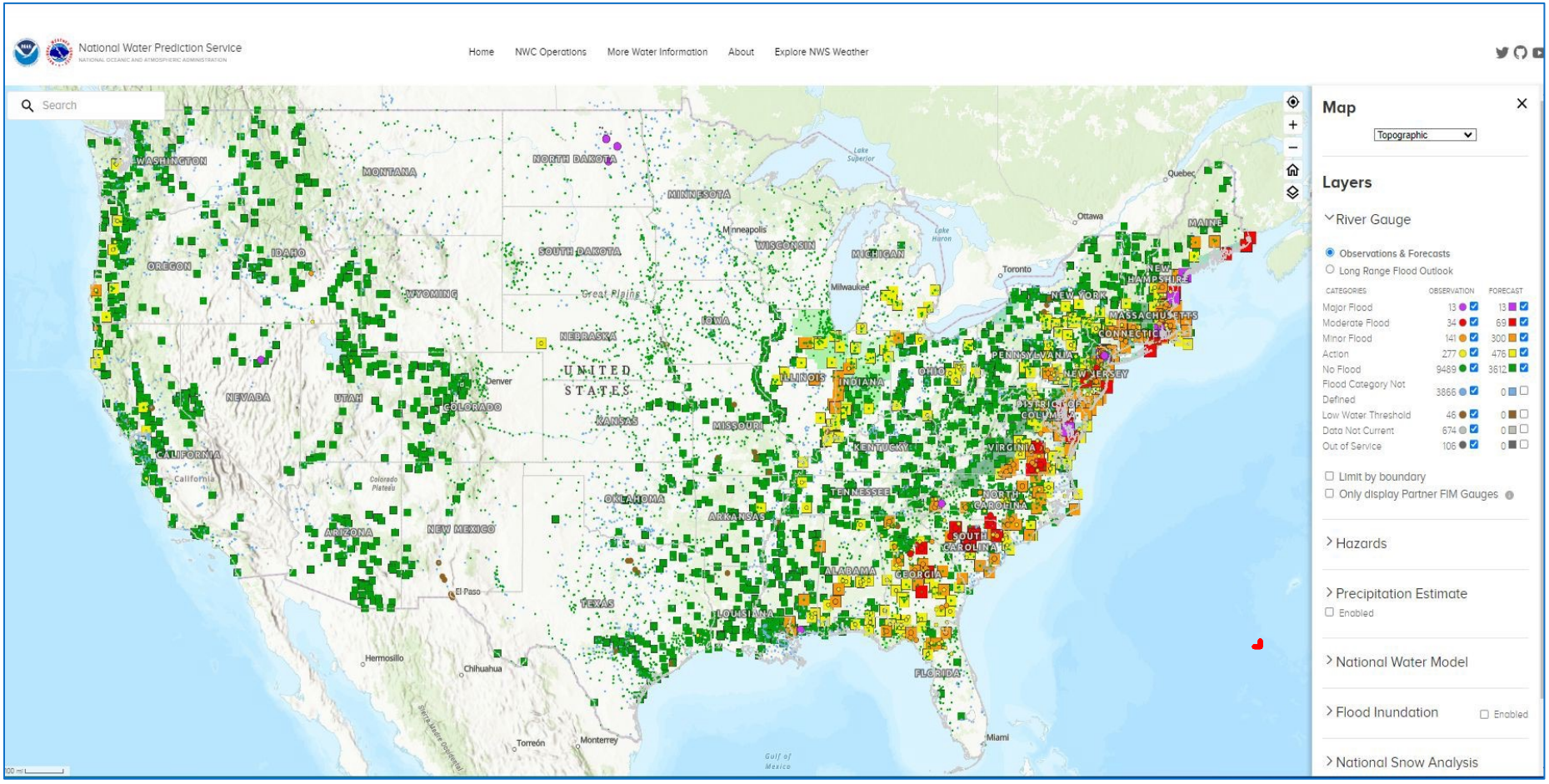
National Water Model Visualizations:

Hotspots - Average Rapid Onset Flooding Probability Forecast (next 12 hours)

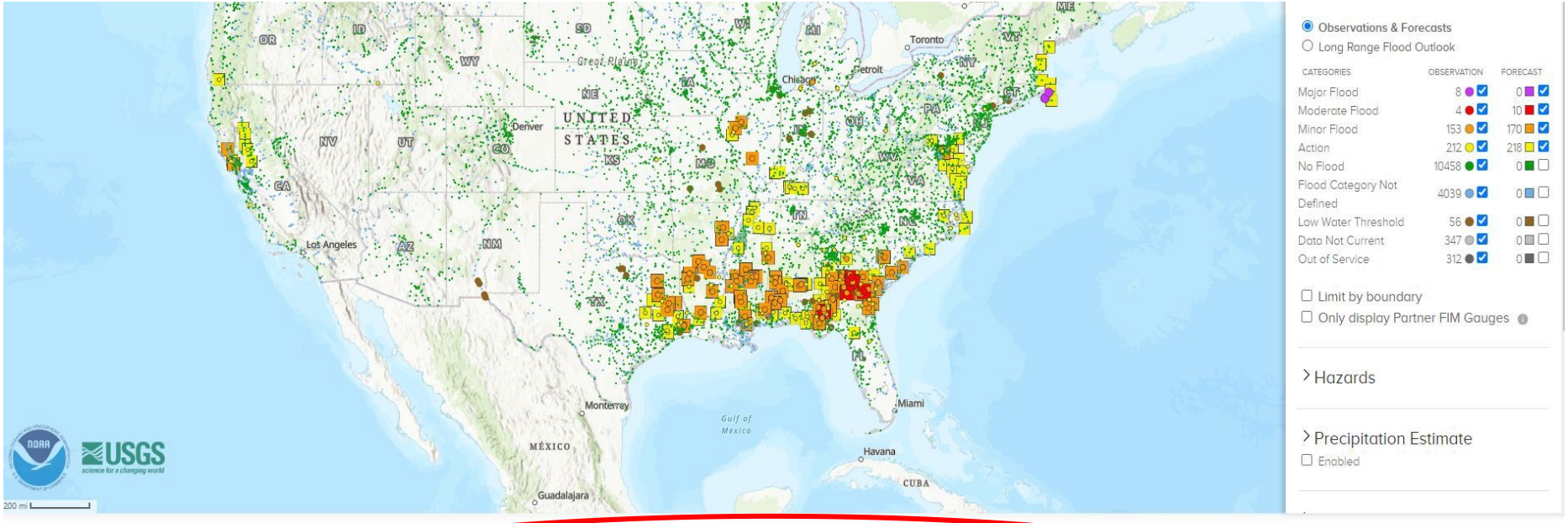


NWM and FIM Services on NWPS

https://water.noaa.gov



NWC Products on NWPS



Hydrologic Discussion EXPERIMENTAL

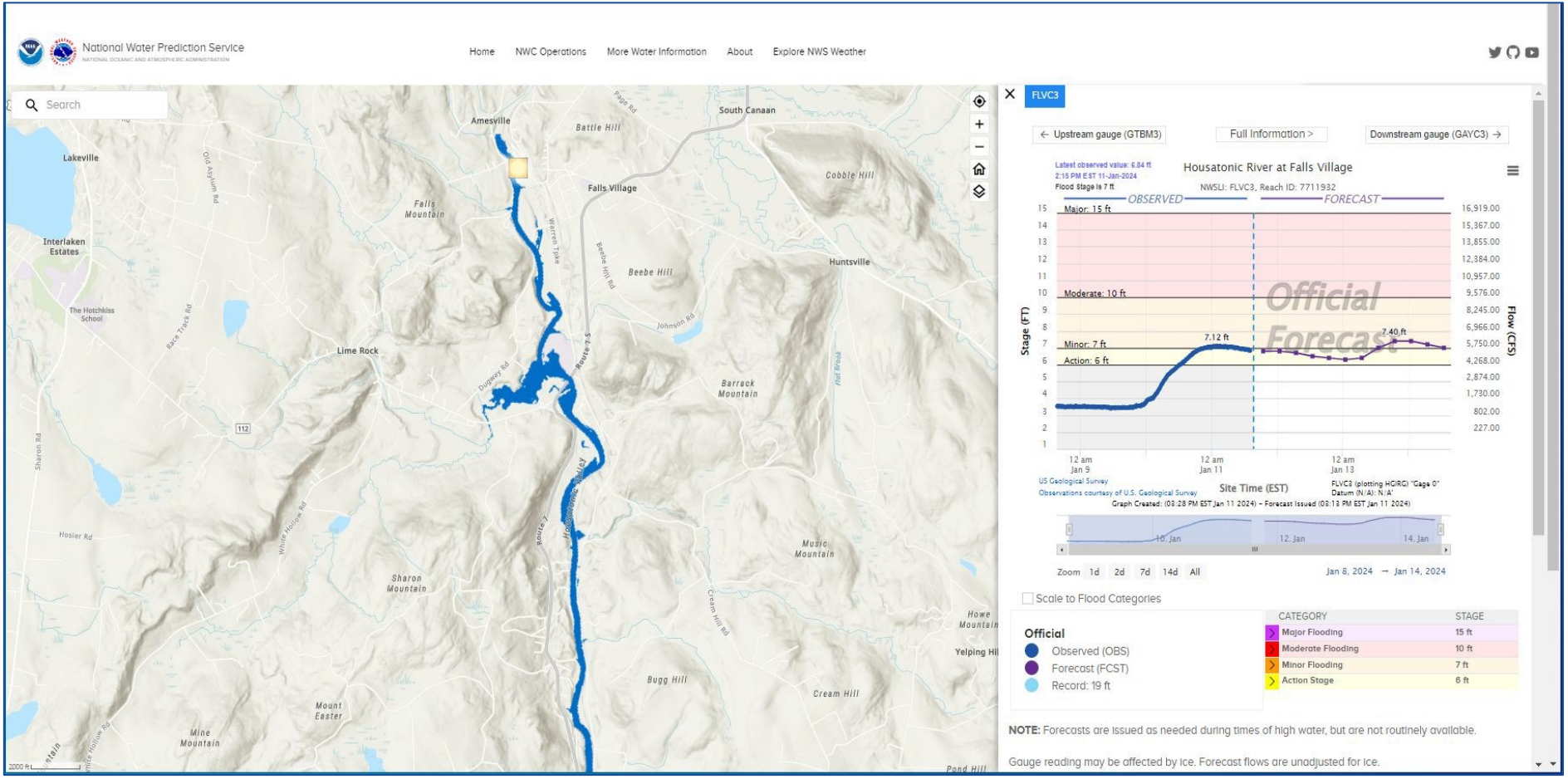
Area Hydrologic Discussion
Archive

National Hydrologic Discussion
Archive

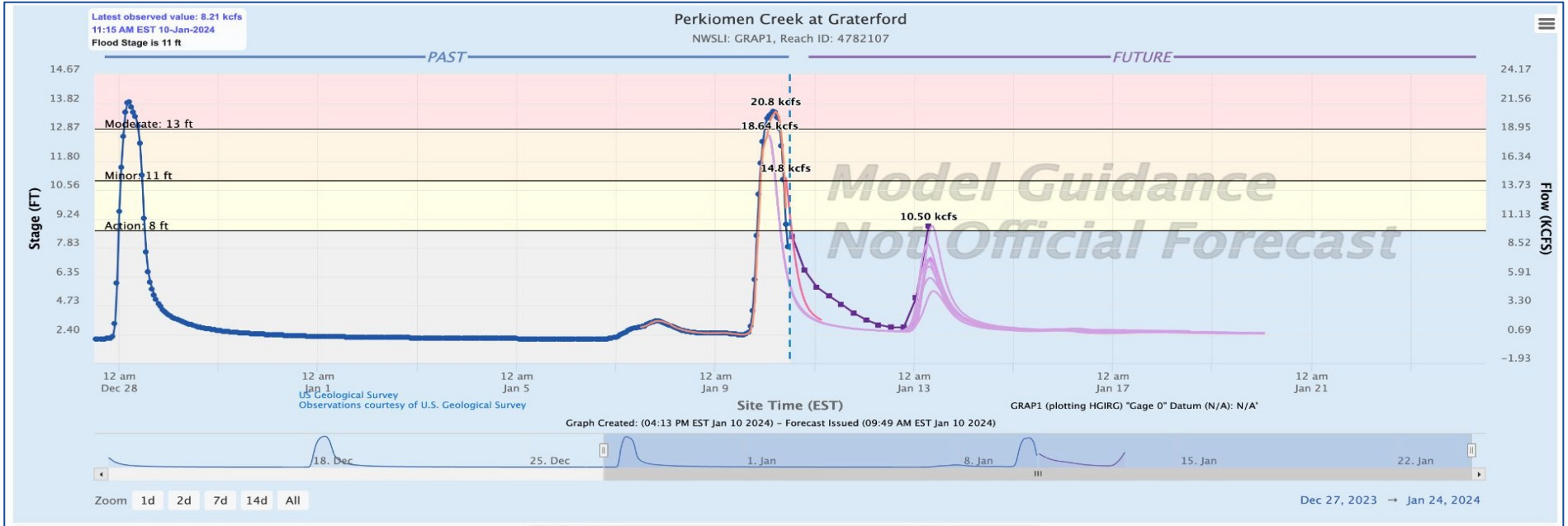
Flood Outlook EXPERIMENTAL

Flood Hazard Outlook
Archives: National Tropical

https://water.noaa.gov

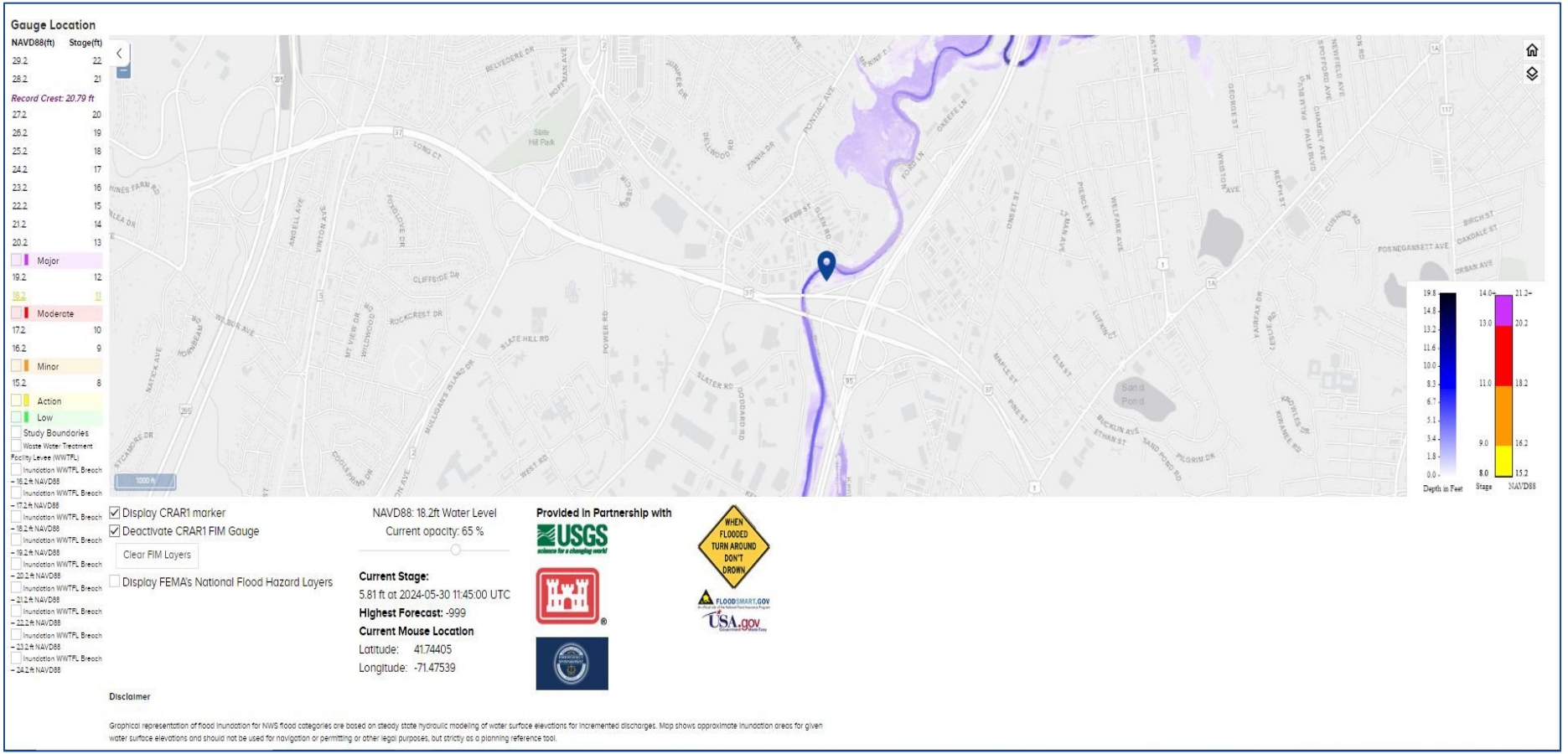


National Water Prediction Service (NWPS)



Example of NWM Guidance for Perkiomen Creek, January 10th, 2024

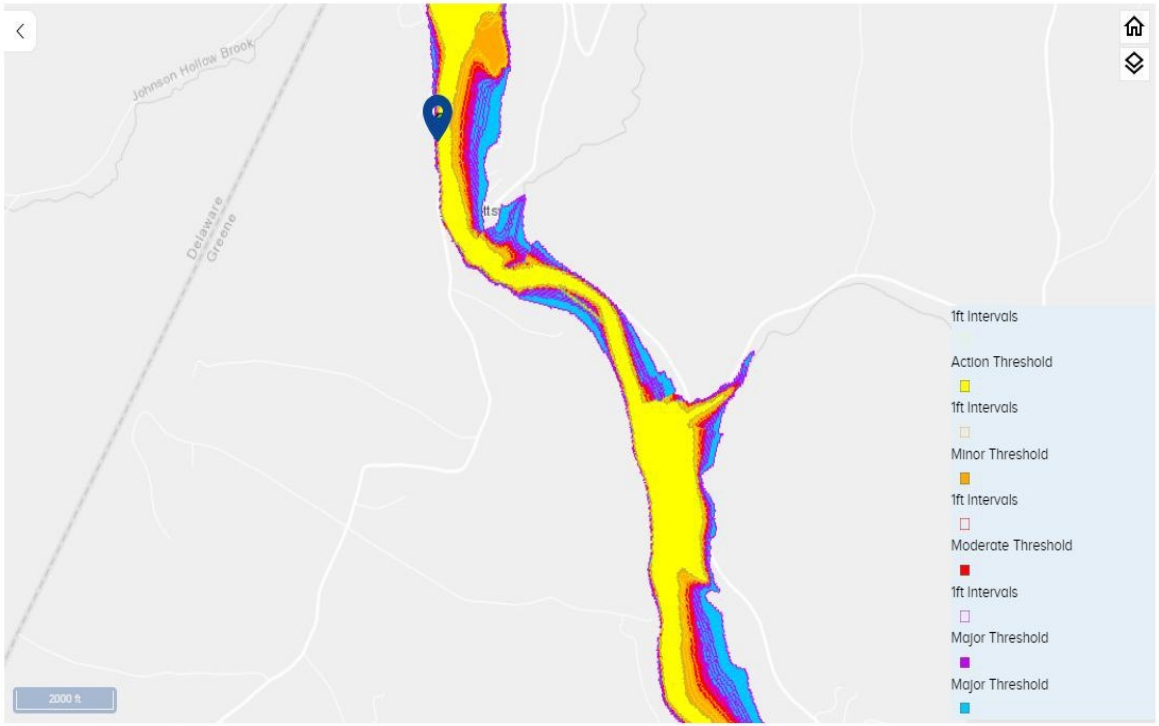
Partner FIM Libraries (formally known as AHPS Libraries)



National Water Prediction Service (NWPS)

Gauge Location

- [x] Action 1ft Intervals
- [x] Action Threshold
- [x] Minor 1ft Intervals
- [x] Minor Threshold
- [x] Moderate 1ft Intervals
- [x] Moderate Threshold
- [x] Major 1ft Intervals
- [x] Major Threshold
- [x] Major Threshold



- [x] Display PTVN6 marker
- [ ] Activate PTVN6 FIM Gauge
- [x] Deactivate PTVN6 CATFIM
- [ ] Display FEMA's National Flood Hazard Layers

Current Stage:
3.89 ft at 2023-12-01 23:22:05 UTC
Highest Forecast: 6.3 ft
Current Mouse Location

Recent Crests

13.85 ft on 10-26-2021 **(P)**
17.53 ft on 12-25-2020 **(P)**
13.55 ft on 10-30-2017
12.03 ft on 02-25-2016
13.71 ft on 09-07-2011
SHOW ALL CRESTS

Historic Crests

24.38 ft on 08-28-2011
19.57 ft on 03-05-1979
19.5 ft on 01-26-1978
19.39 ft on 01-19-1996
19.14 ft on 10-16-1955
SHOW ALL CRESTS

Flood Inundation Mapping Timeline

2017 — NWC Summer Institute

- Demonstrated continental scale FIM capability using the Height Above Nearest Drainage (HAND) method.

2019 — First DOC/NOAA Agency Priority Goal

- Near real-time demonstration in Texas.
- Completed two tabletop exercises with core stakeholders and emergency responders.

2021 — Second DOC/NOAA Agency Priority Goal

- Near real-time demonstration in Texas and along the Atlantic Coast.
- Completed two tabletop exercises across the Northeast with core stakeholders and emergency responders.

2023 — Operational FIM for 10% of U.S. Population

- Begin delivery of FIM services and Impact-based Decision Support Services (IDSS).
- Leverage cloud-based solution.

2026 — Operational FIM for nearly 100% of U.S. Population

- Integrated FIM capabilities and services across the U.S.
- Total Water Level FIM forecasts along the coasts.

NWS Flood Inundation Mapping Services Implementation

Map Legend

10% Population served by **October 2023**.

30% Population served by **October 2024**.

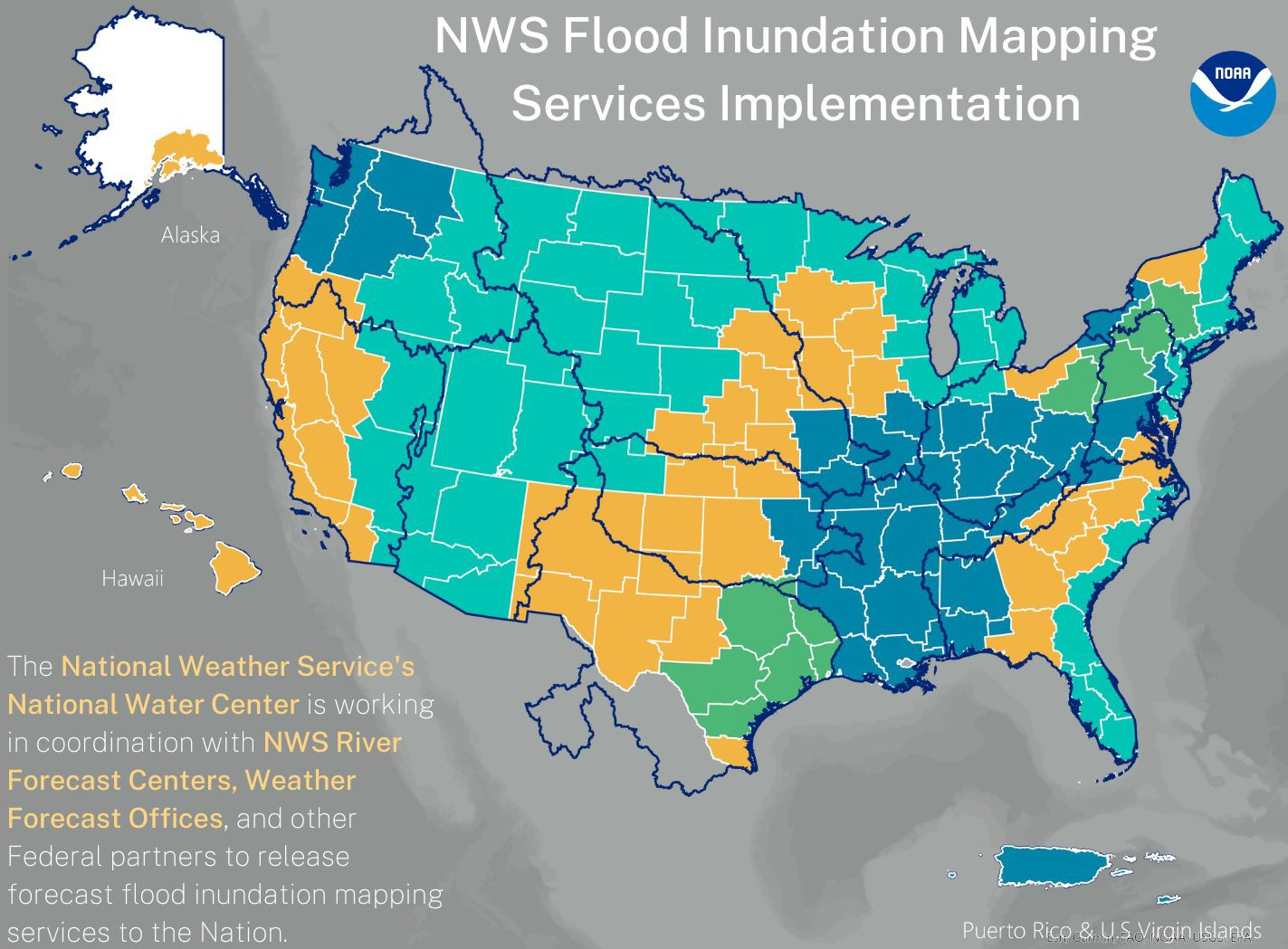
60% Population served by **October 2025**.

100% Population served by **October 2026**.

NWS County Warning Areas

NWS River Forecast Center Boundaries

*100% is approximate. Does not include all parts of Alaska, American Samoa, and Guam. Implementation areas are subject to change.



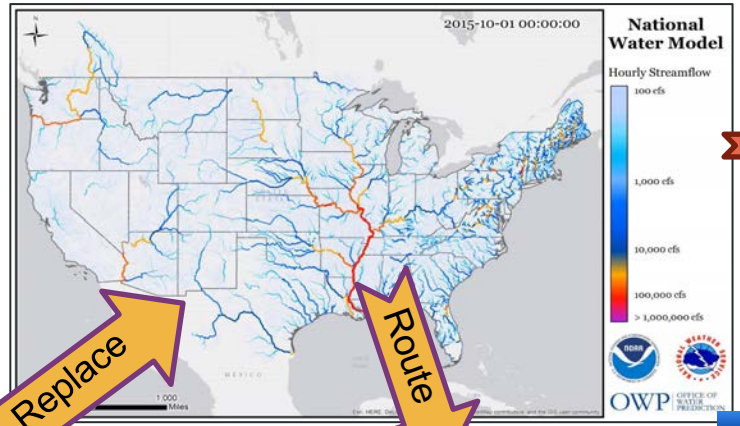
The **National Weather Service's National Water Center** is working in coordination with **NWS River Forecast Centers, Weather Forecast Offices**, and other Federal partners to release forecast flood inundation mapping services to the Nation.

The Method behind FIM Services: Height Above Nearest Drainage (HAND)

Deliver Forecast Flood Inundation Services

National Water Model Guidance

Completely automated process with no forecaster engagement – but provides complimentary guidance on ~3.4 million stream miles nationwide, including Puerto Rico and the Virgin Islands, Hawaii, and by the fall - portions of Alaska

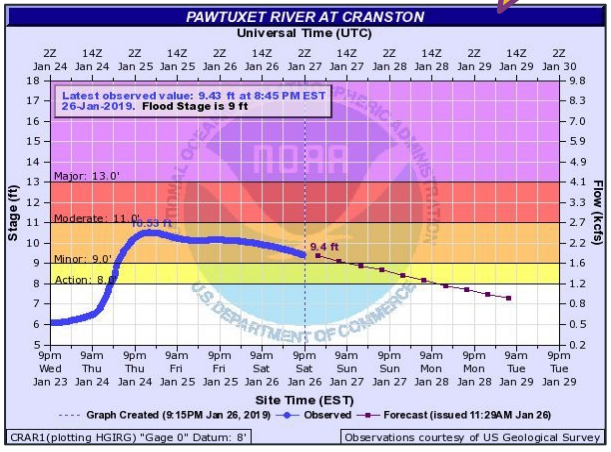


Replace

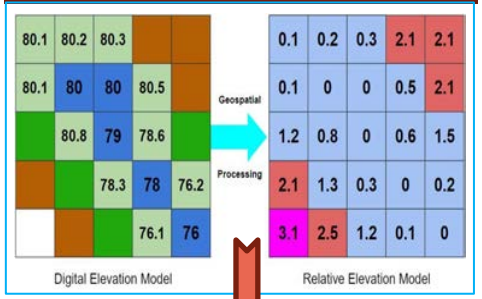
Route

River Center Forecasts

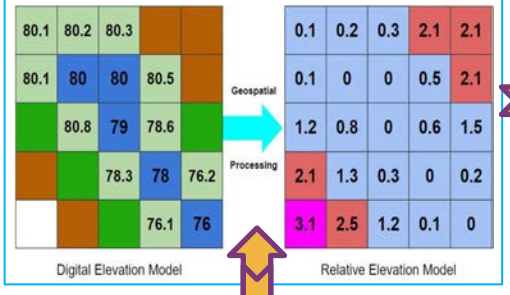
Forecasters heavily engaged in the forecast production



Height Above Nearest Drainage (HAND)

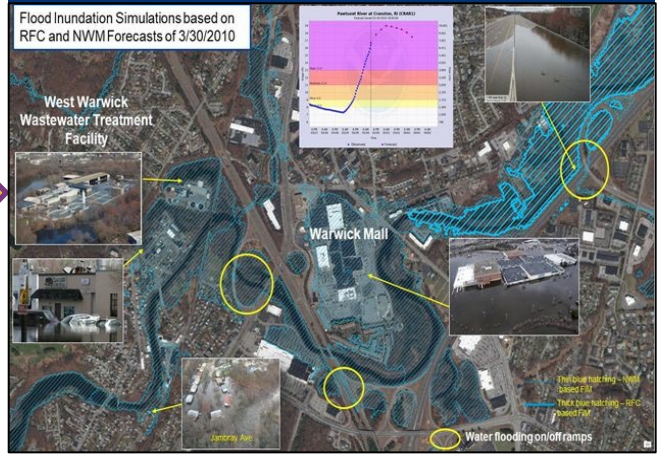


Height Above Nearest Drainage (HAND)

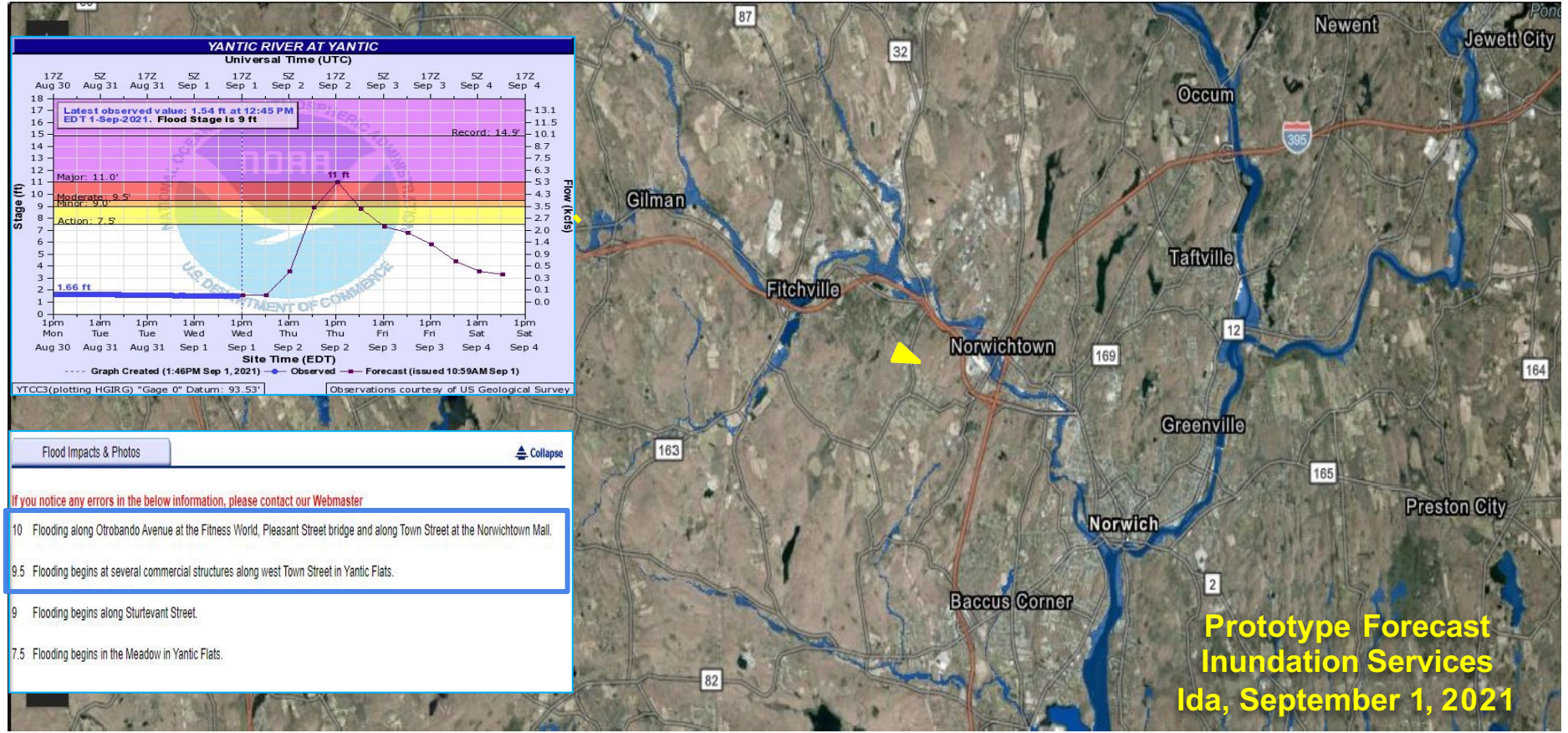


+RAStoFIM & RAStoREM techniques

Pawtuxet River Valley West Warwick/Warwick



Value of FIM Services - Visualizations to depict impacts



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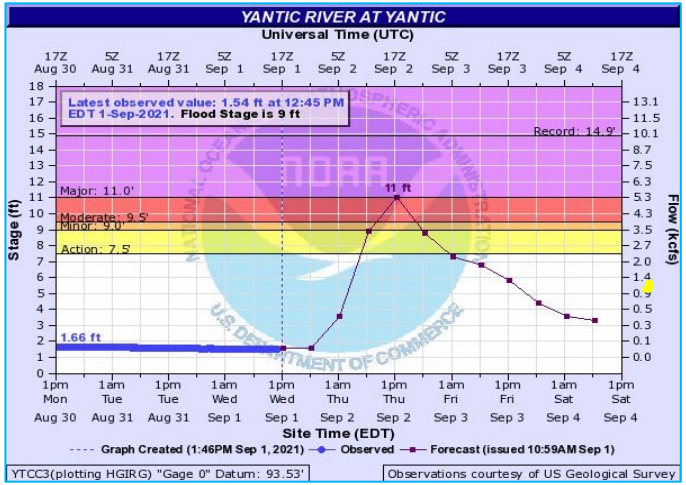
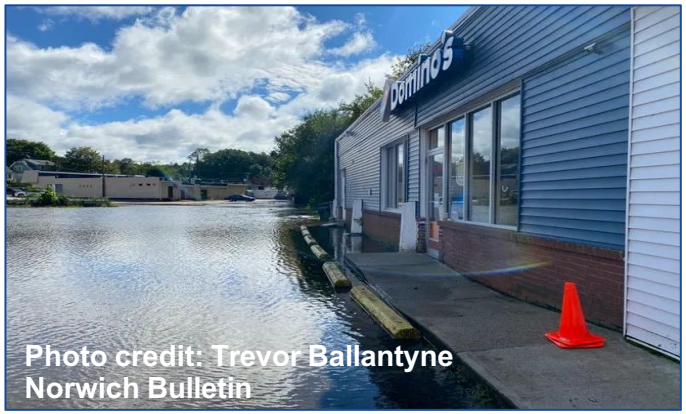
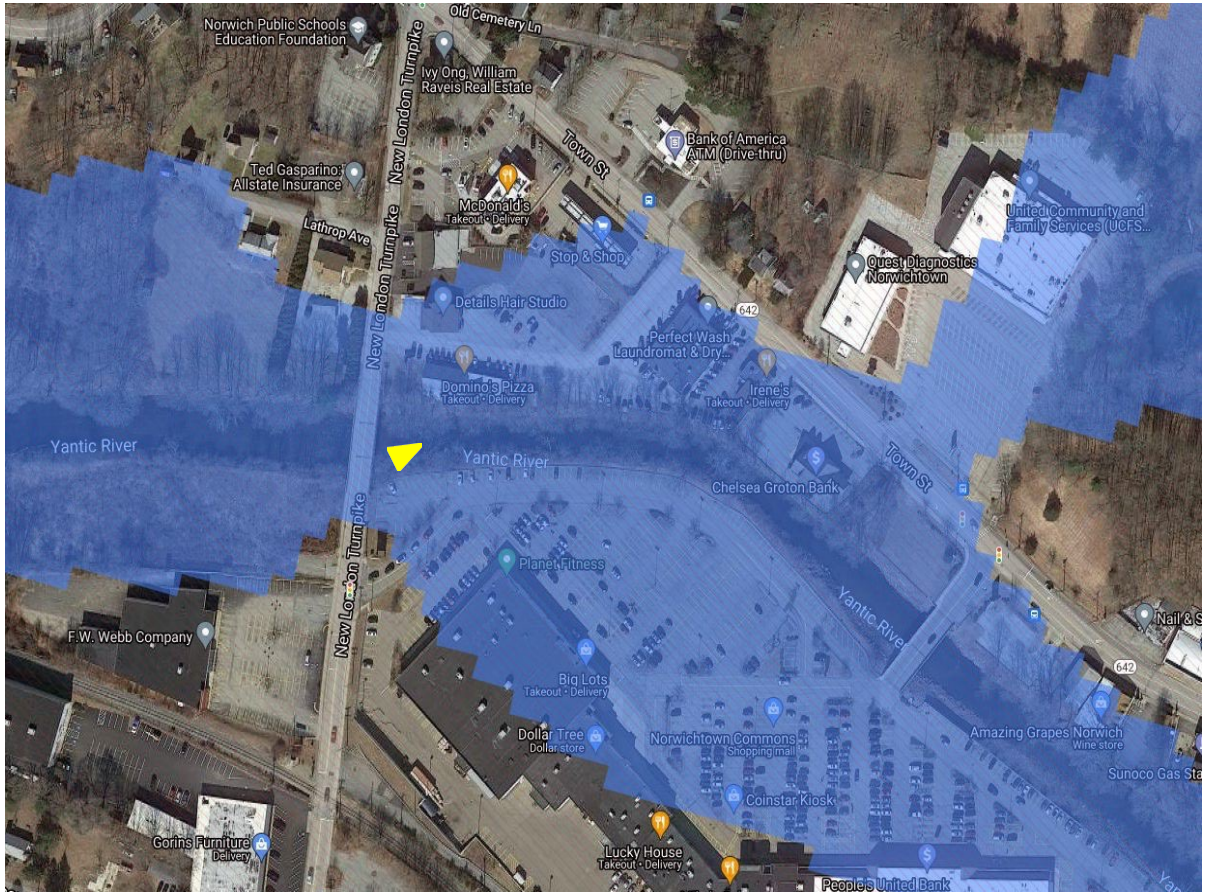






Integrating FIM Services into our IDSS

Disclaimer: This experimental map represents the NWS's best approximation of inundation based upon modeled river discharge

Yantic River at Yantic, CT

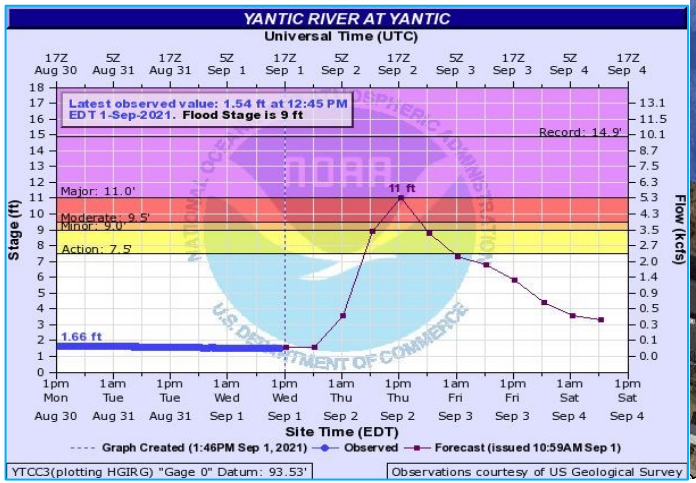
Forecast Crest Height: **11 Feet**

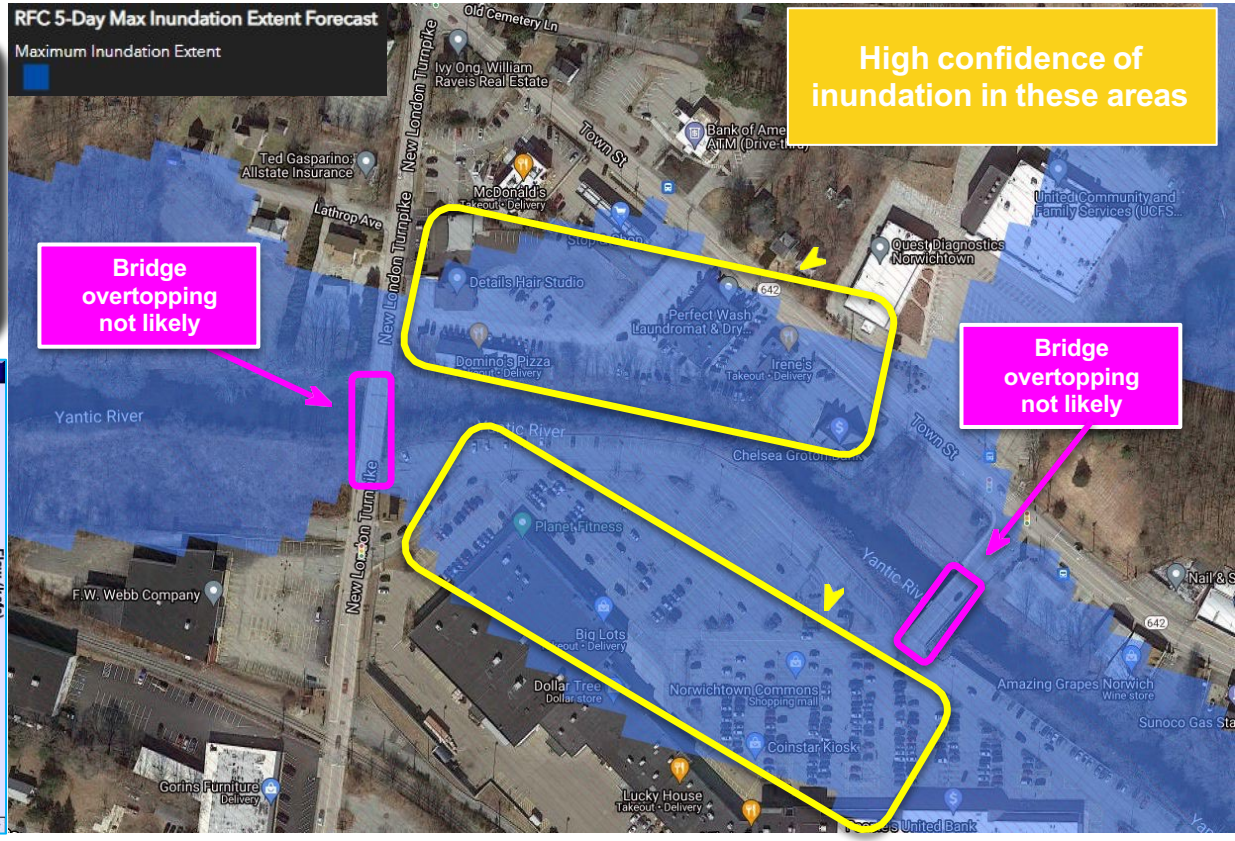
Map Height Shown: **11 Feet**

FIM Source: **RFC FIM 5 Day Max Extent**

FIM Type: **Dynamic (Depth NOT Included)**

FIM Creation Time: **Sept 1st, 1 pm**





FIM & NWM Visualizations
Experimental Services

FIM Services available for 10% of the nation

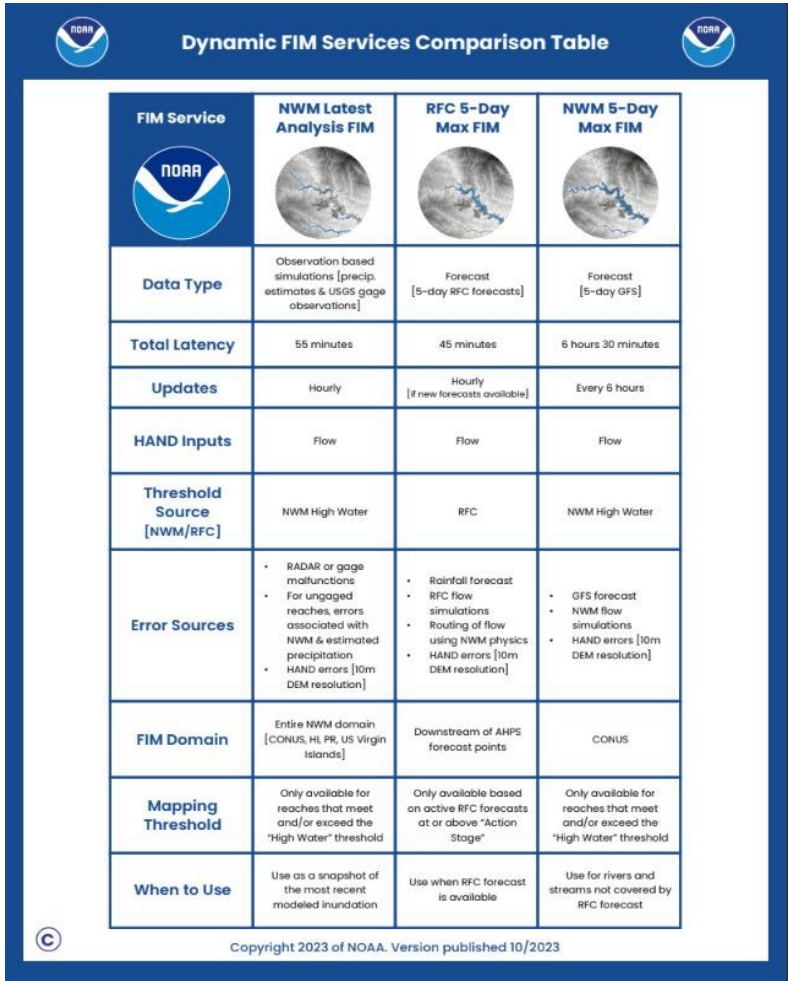
- *NWM Latest Analysis FIM*
- *RFC 5-Day Max Extent FIM*
- *NWM 5-Day Max Extent FIM*

Non-FIM NWM Services

- *High Water & Peak Flow Arrival Time, Max High Flow Magnitude Forecast, & High Water Probability Forecasts*
- *Rapid Onset Flooding Probability Forecasts*
- Services available for ingest into your local GIS systems

Visualizations available on NWPS & the NWS GIS Viewer

- *NWPS (https://water.noaa.gov)*
  Includes FIM services, CATFIM in 10% area, RFC & NWM forecast hydrographs, and a few NWM non-FIM visualizations
- *NWS GIS Viewer (https://viewer.weather.noaa.gov/water)*
  Includes FIM services and all Non-FIM NWM services



Dynamic FIM Services Comparison Table

FIM Service	NWM Latest Analysis FIM	RFC 5-Day Max FIM	NWM 5-Day Max FIM
Data Type	Observation based simulations [precip. estimates & USGS gage observations]	Forecast [5-day RFC forecasts]	Forecast [5-day GFS]
Total Latency	55 minutes	45 minutes	6 hours 30 minutes
Updates	Hourly	Hourly [if new forecasts available]	Every 6 hours
HAND Inputs	Flow	Flow	Flow
Threshold Source [NWM/RFC]	NWM High Water	RFC	NWM High Water
Error Sources	• RADAR or gage malfunctions • For ungaged reaches, errors associated with NWM & estimated precipitation • HAND errors [10m DEM resolution]	• Rainfall forecast • RFC flow simulations • Routing of flow using NWM physics • HAND errors [10m DEM resolution]	• GFS forecast • NWM flow simulations • HAND errors [10m DEM resolution]
FIM Domain	Entire NWM domain [CONUS, HI, PR, US Virgin Islands]	Downstream of AHPS forecast points	CONUS
Mapping Threshold	Only available for reaches that meet and/or exceed the "High Water" threshold	Only available based on active RFC forecasts at or above "Action Stage"	Only available for reaches that meet and/or exceed the "High Water" threshold
When to Use	Use as a snapshot of the most recent modeled inundation	Use when RFC forecast is available	Use for rivers and streams not covered by RFC forecast

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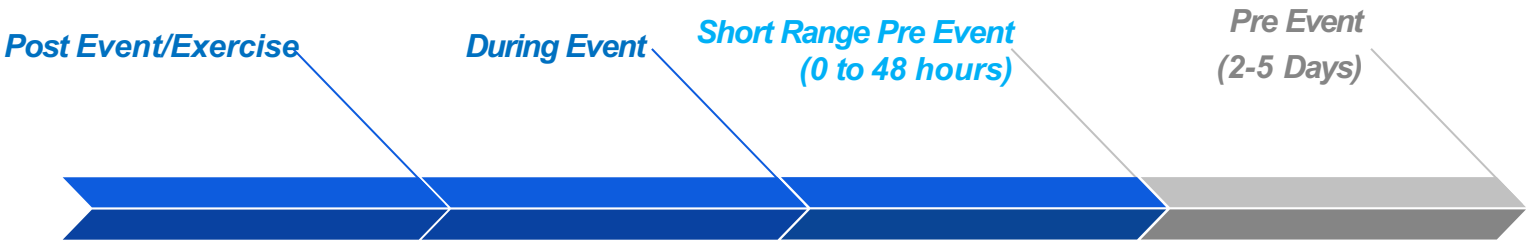
https://www.weather.gov/owp/operations

Tip of the Iceberg

Other Opportunities for Flood Maps to Benefit Decision Makers



Verification/Recovery

This helps new users gain confidence in the mapping. Introduce them in a non stressful situation to gain knowledge and ask doubting questions

Reactionary Response

Mapping used to help answer questions for ongoing flooding. Shows real time validation as well as provides some decision support for onsite or realtime inquiries

Proactive Response

Mapping in this phase would allow decision makers to move resources to close roads, perform rescues, or even localized evacuations before the flooding arrives.

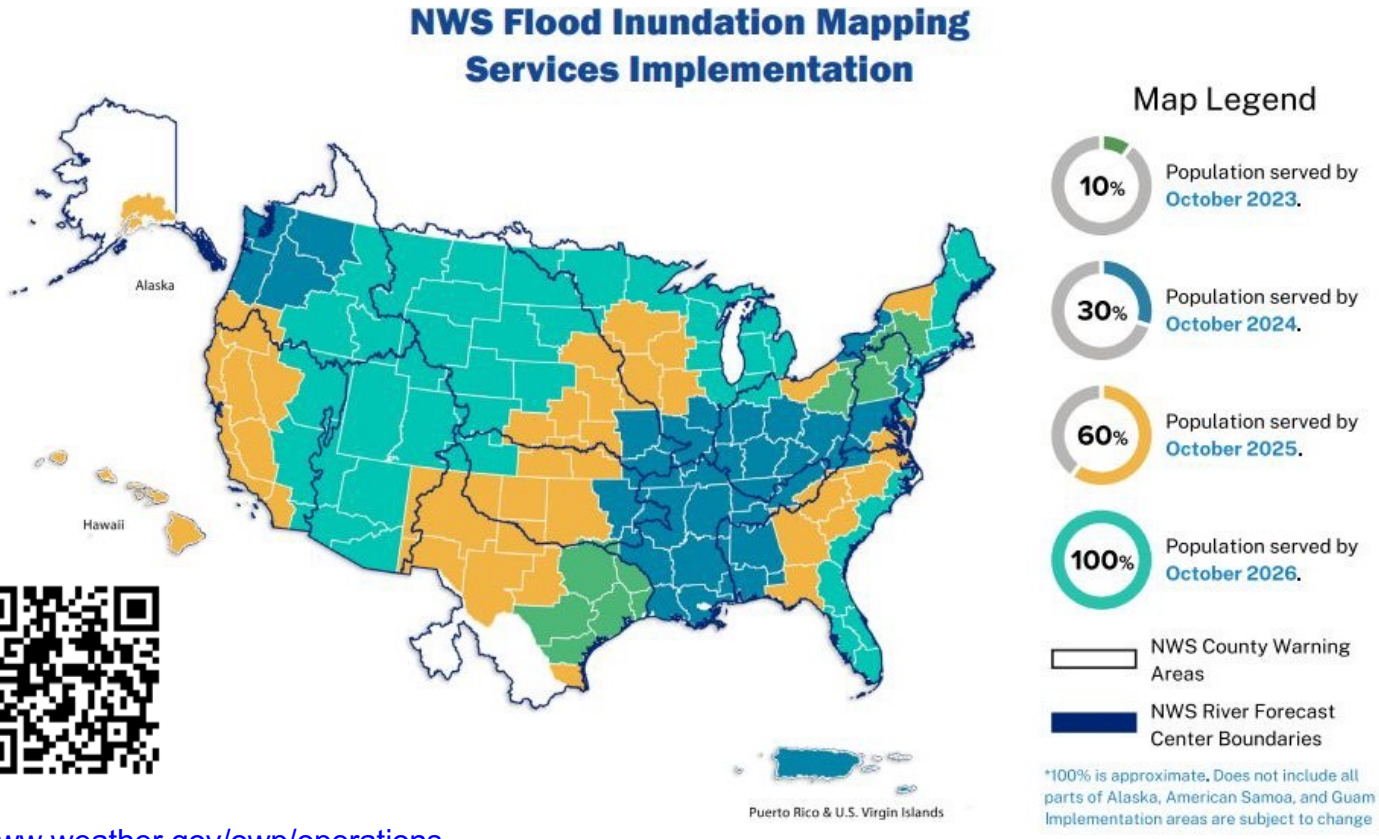
Preparation

Before an event large scale resources that may be required could be ordered and relocated. Assistance requested in advance to communities less prepared for expected flooding impacts

Some Early Success

Near Term Opportunity

Phased Implementation Approach Through 2026



OWP Operations

https://www.weather.gov/owp/operations

Thank You!

David R. Vallee

david.vallee@noaa.gov

https://water.noaa.gov

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