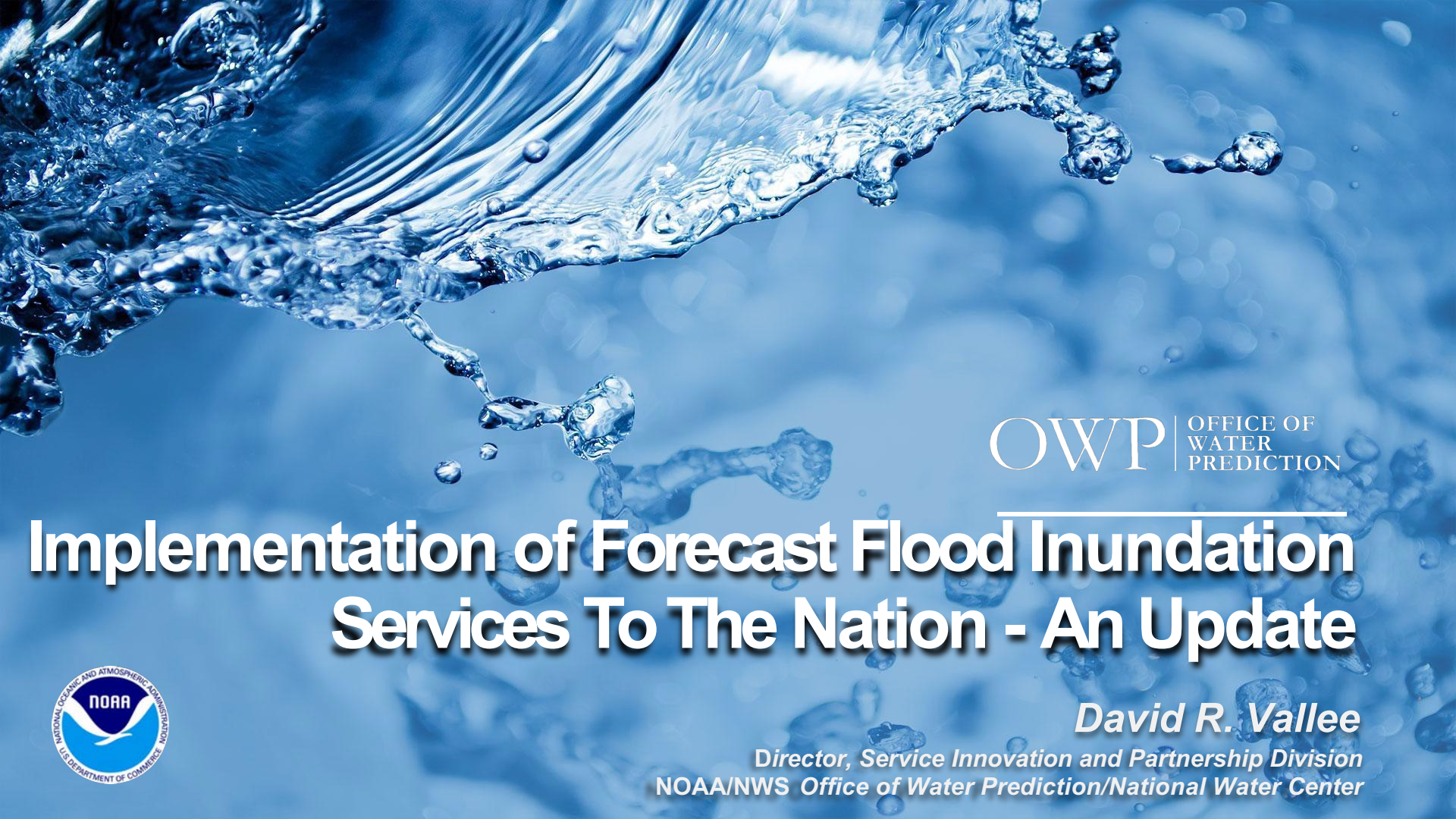


A high-speed photograph of water splashing, creating a dynamic, blue-toned background with many droplets and ripples.

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# 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*

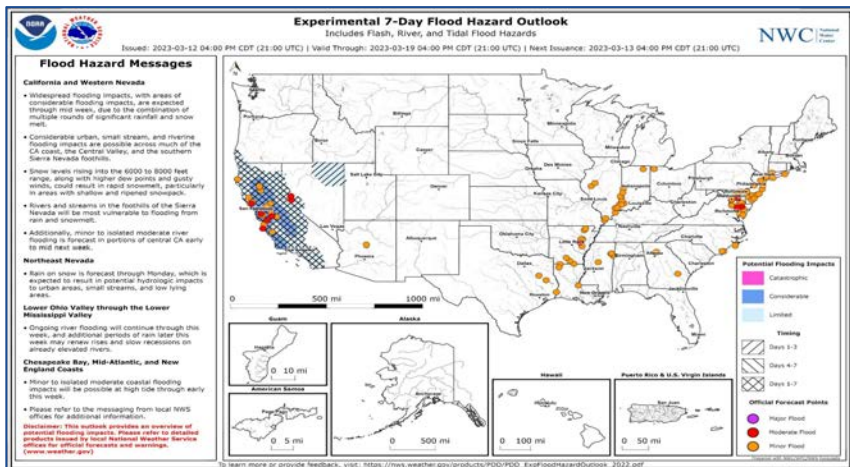
# Outline for this session

---

- 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

[Weather.gov](#) > [Office of Water Prediction](#) > National Water Center Products and Services

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

Office of Water Prediction  
National Program

NWC  
National Water Center



### !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](mailto: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 the National Water Model analyses and forecasts. Services are available via the "Viewer", or directly via URL's 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 graphics 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 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.



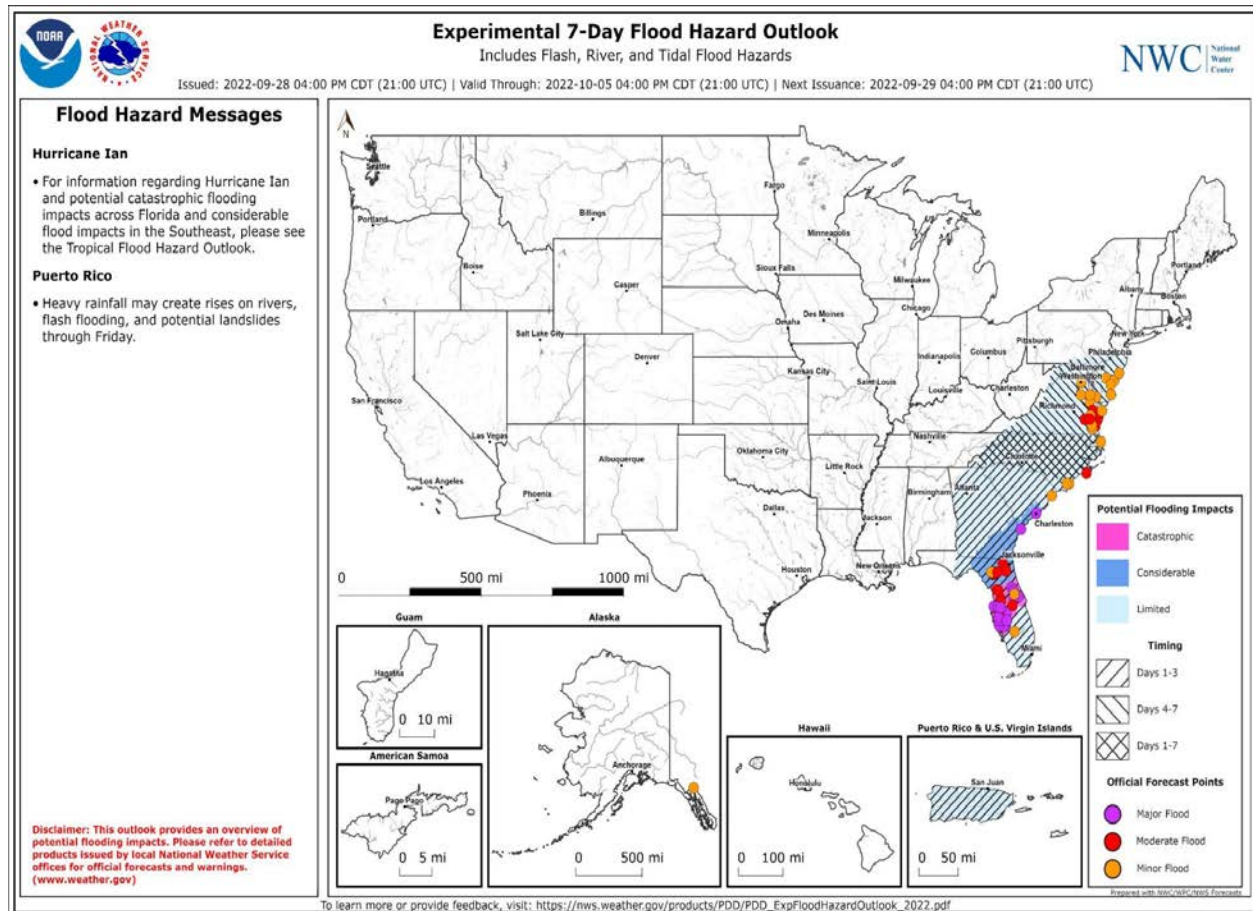
### NWC Visualization Services

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 URL's hosted on the Hydrologic Visualization and Inundation Services (HydroVIS) cloud resource.

Public Services Handbook

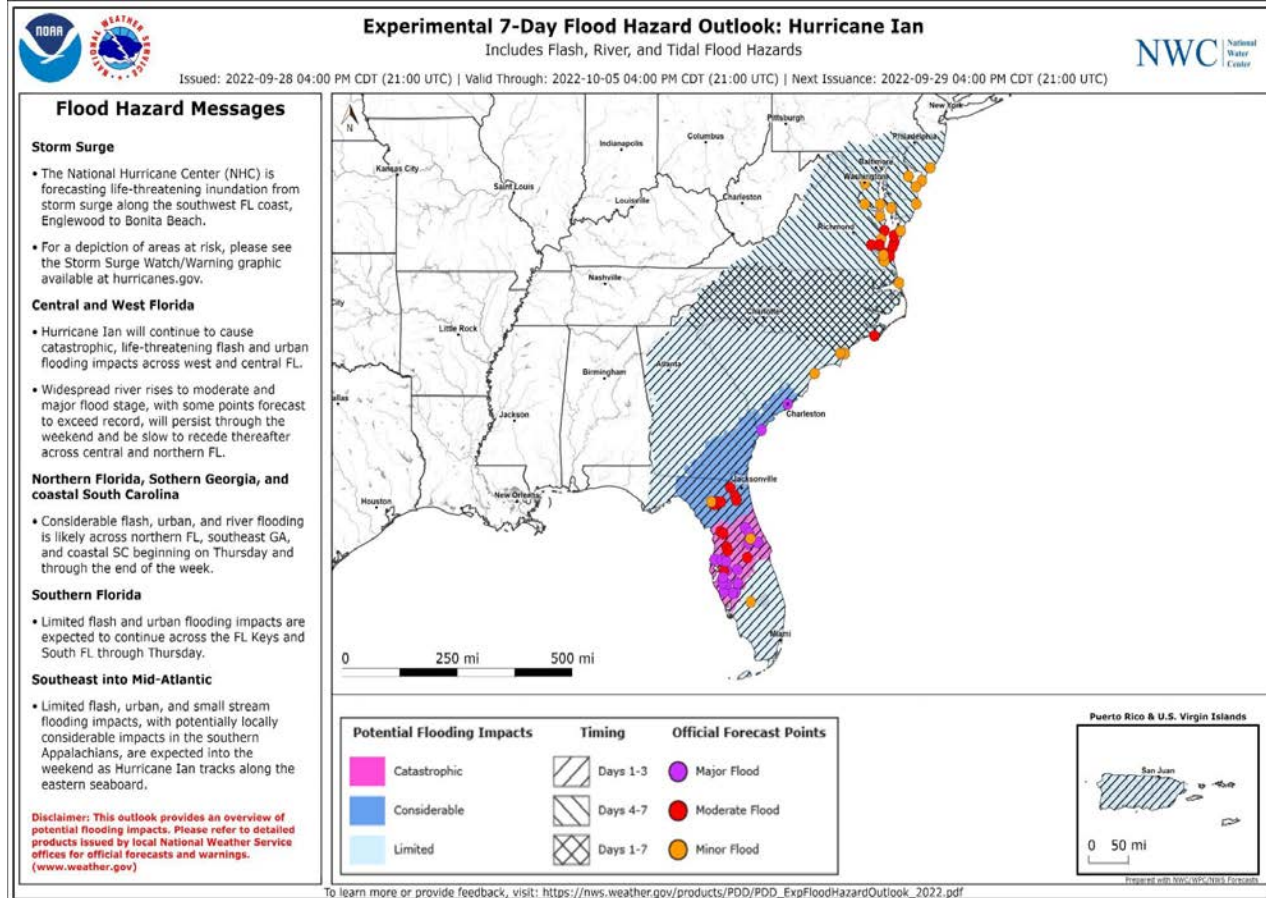
# FHO

- 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



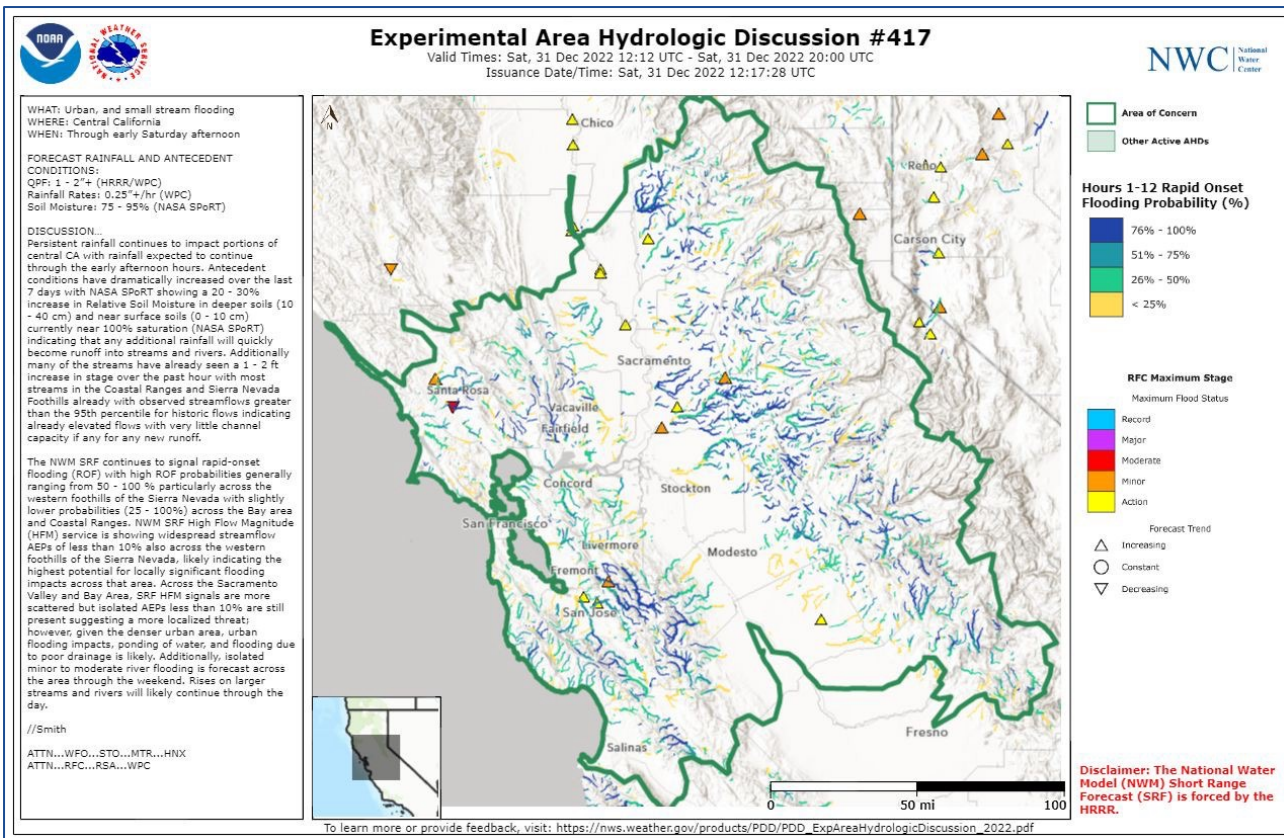
# Tropical FHO

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



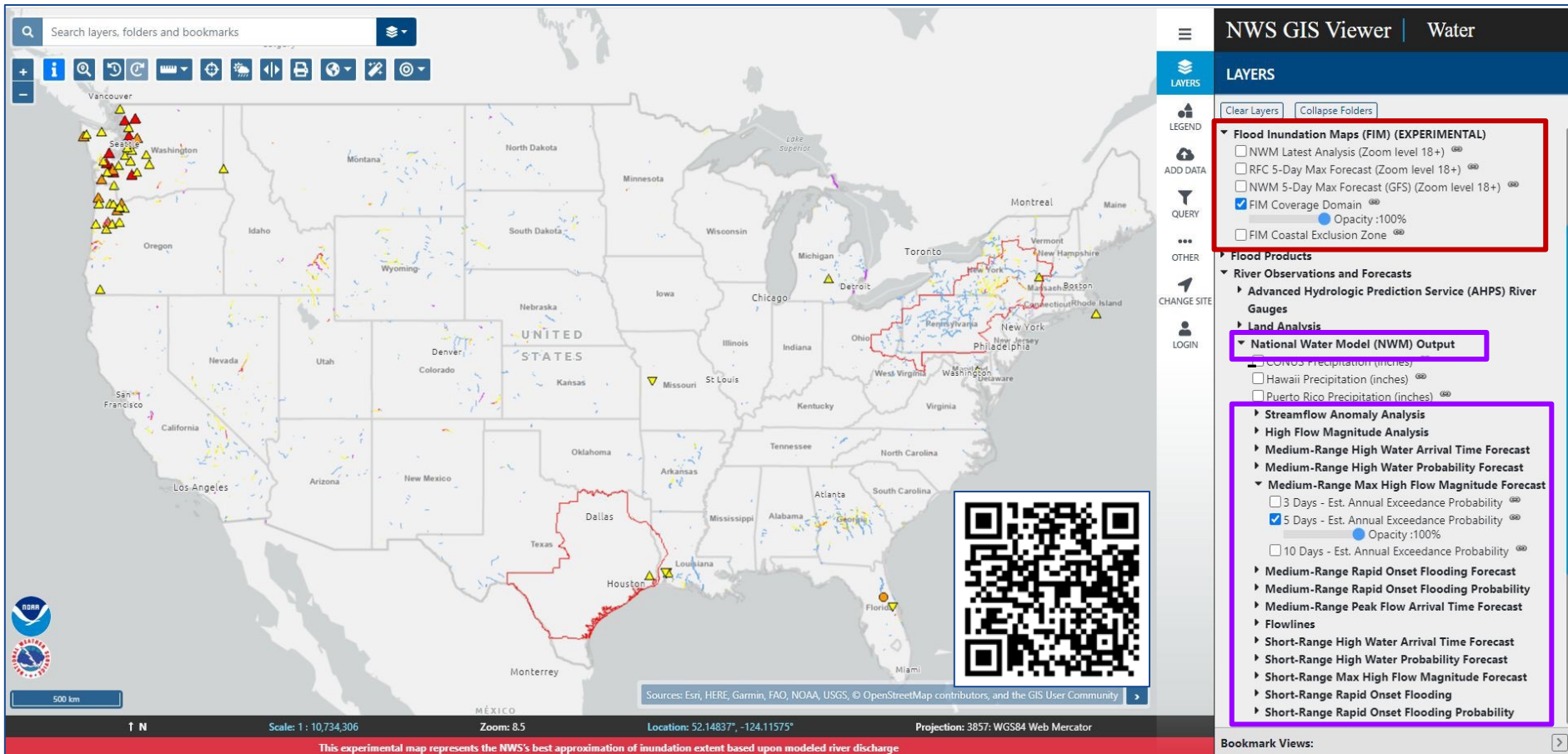
# AHD

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



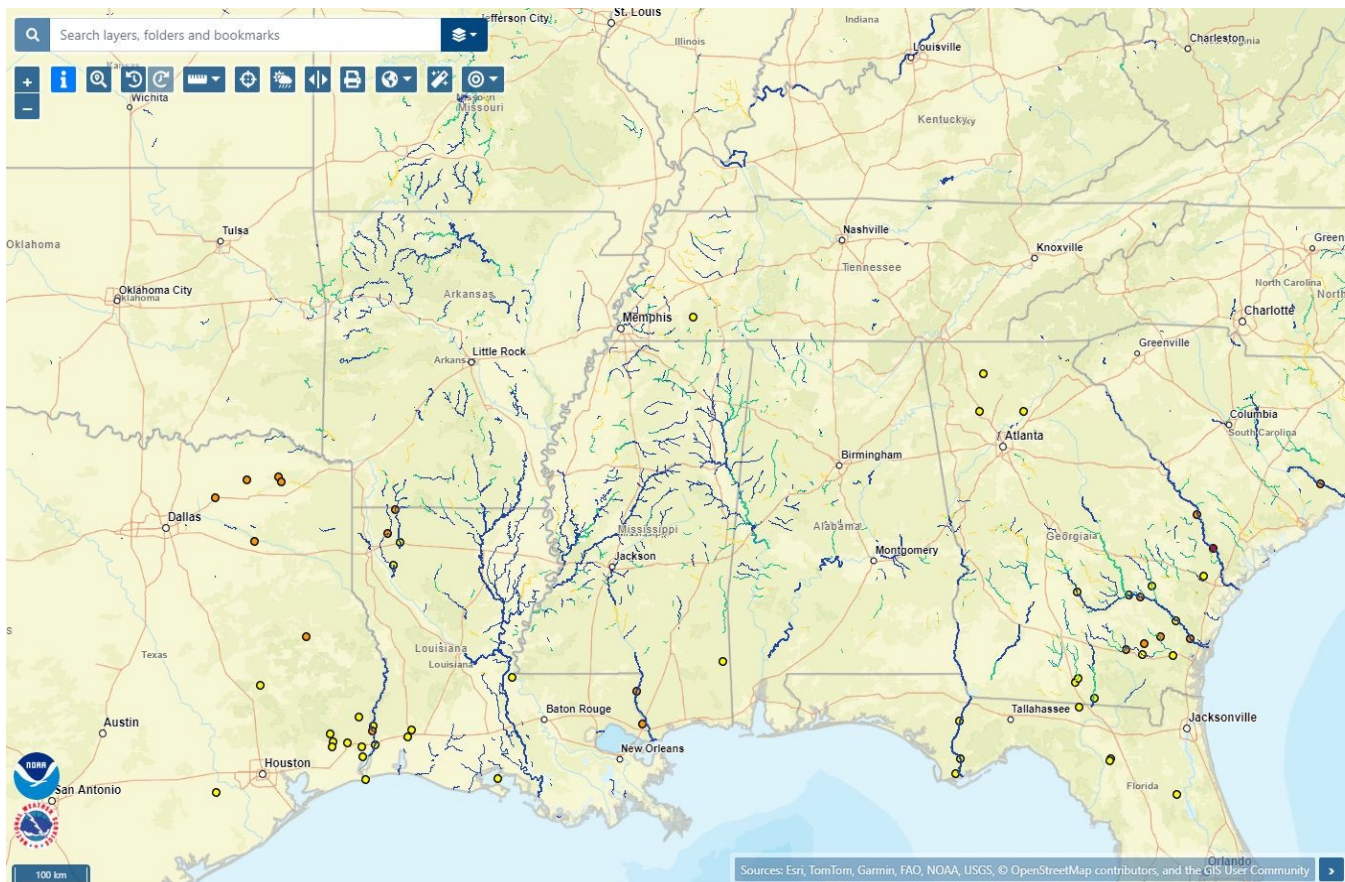
# NWM and FIM Services - NWS National Viewer

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



# National Water Model Visualizations:

## High Water Probability Forecast



**NWS GIS Viewer** | Water

**LEGEND**

**US State Borders**

- NWS States Borders

**Observed River Stages - at or near flooding**

- Major Flooding
- Moderate Flooding
- Minor Flooding
- Near Flood

**Days 1-5 - High Water Probability**

- 76% - 100%
- 51% - 75%
- 26% - 50%
- < 25%
- Insufficient Data

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

↑ N

Scale: 1 : 3,729,269

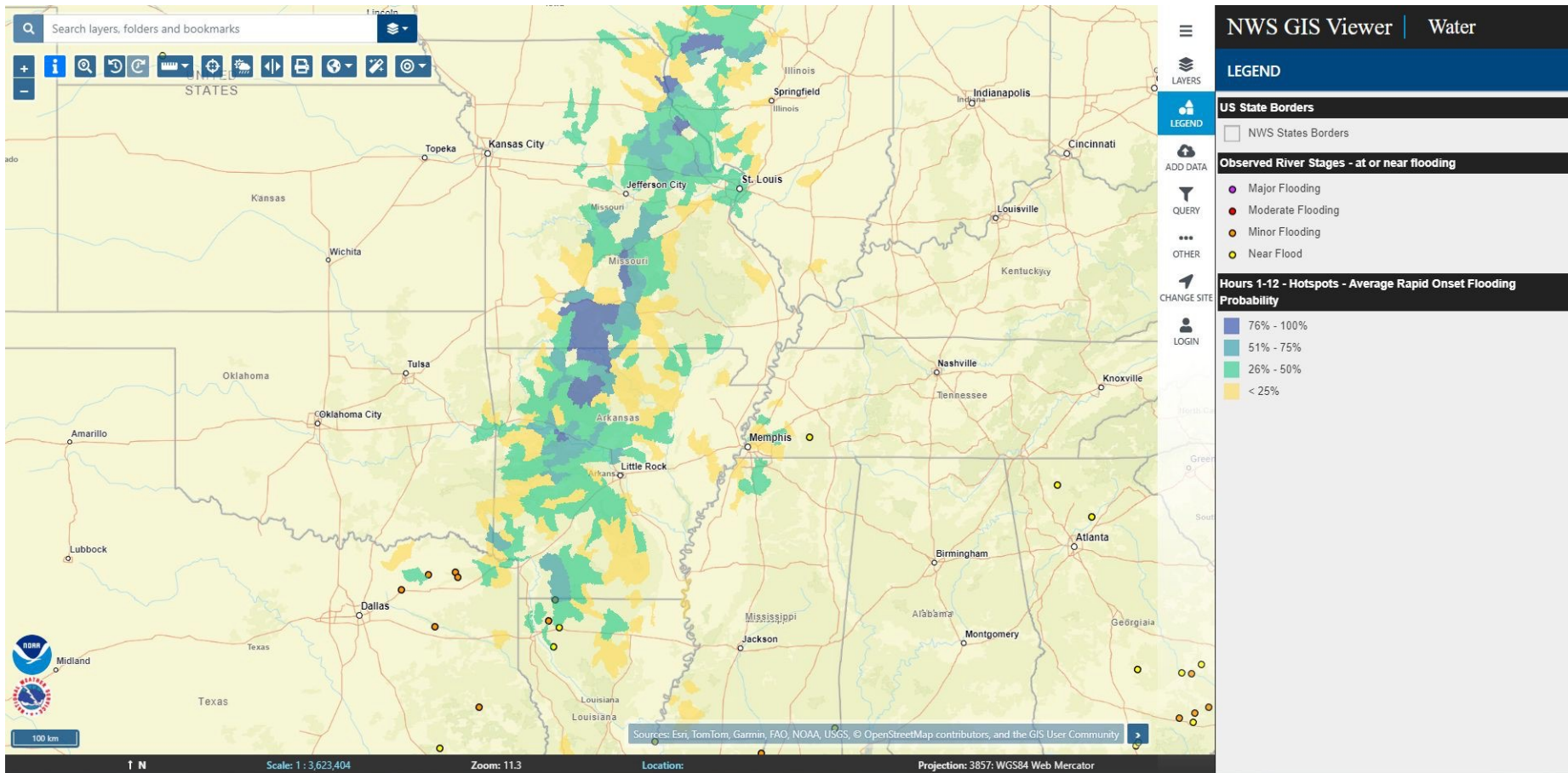
Zoom: 11.3

Location:

Projection: 3857: WGS84 Web Mercator

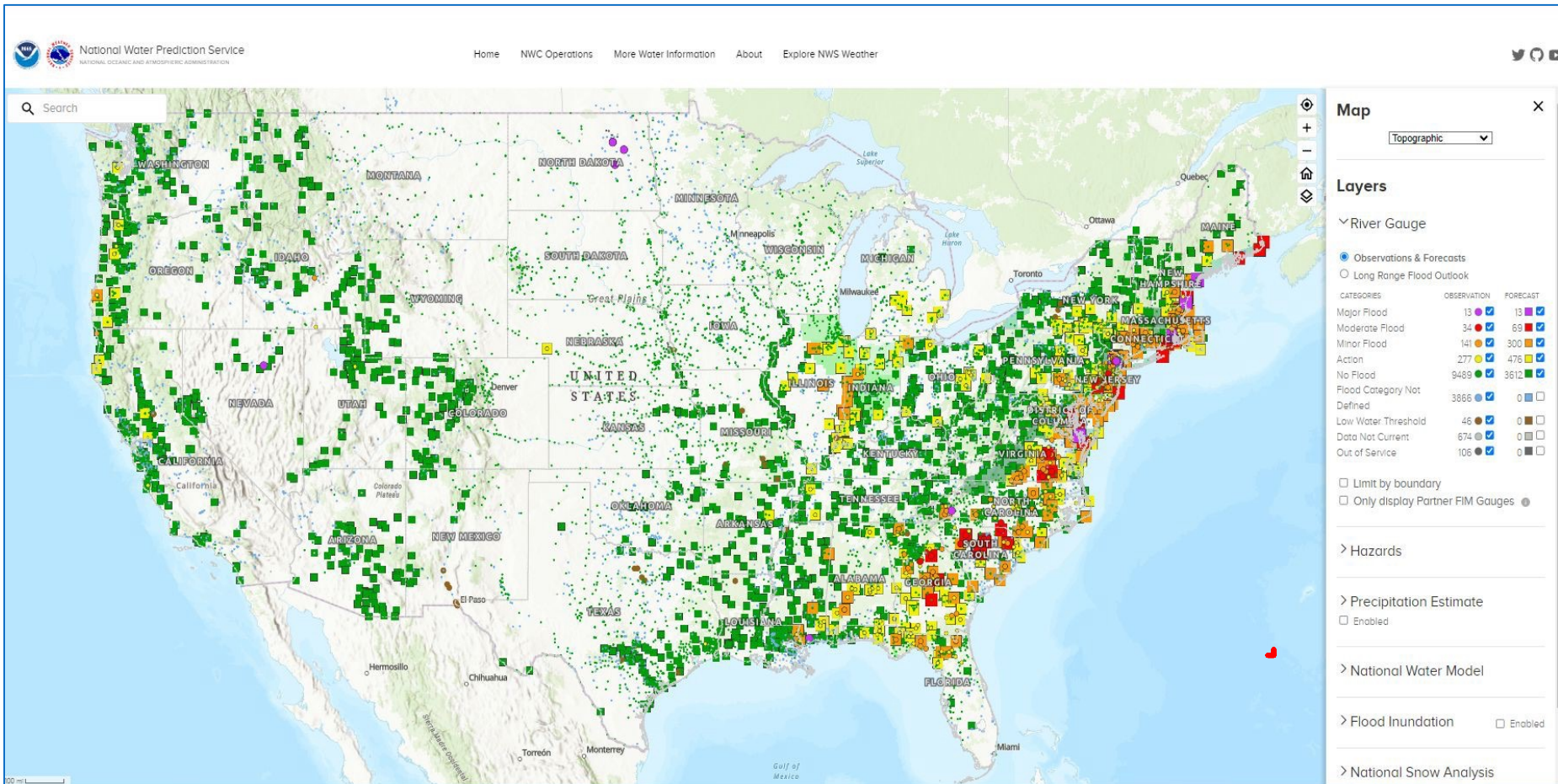
## National Water Model Visualizations:

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

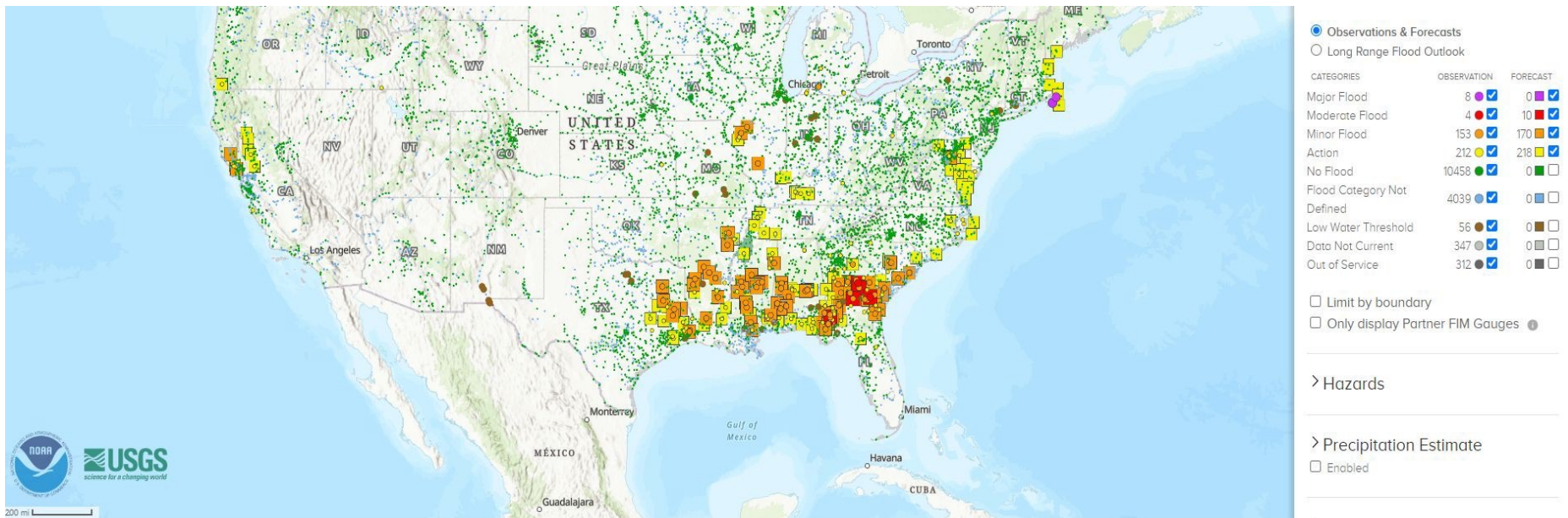


# NWM and FIM Services on NWPS

<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



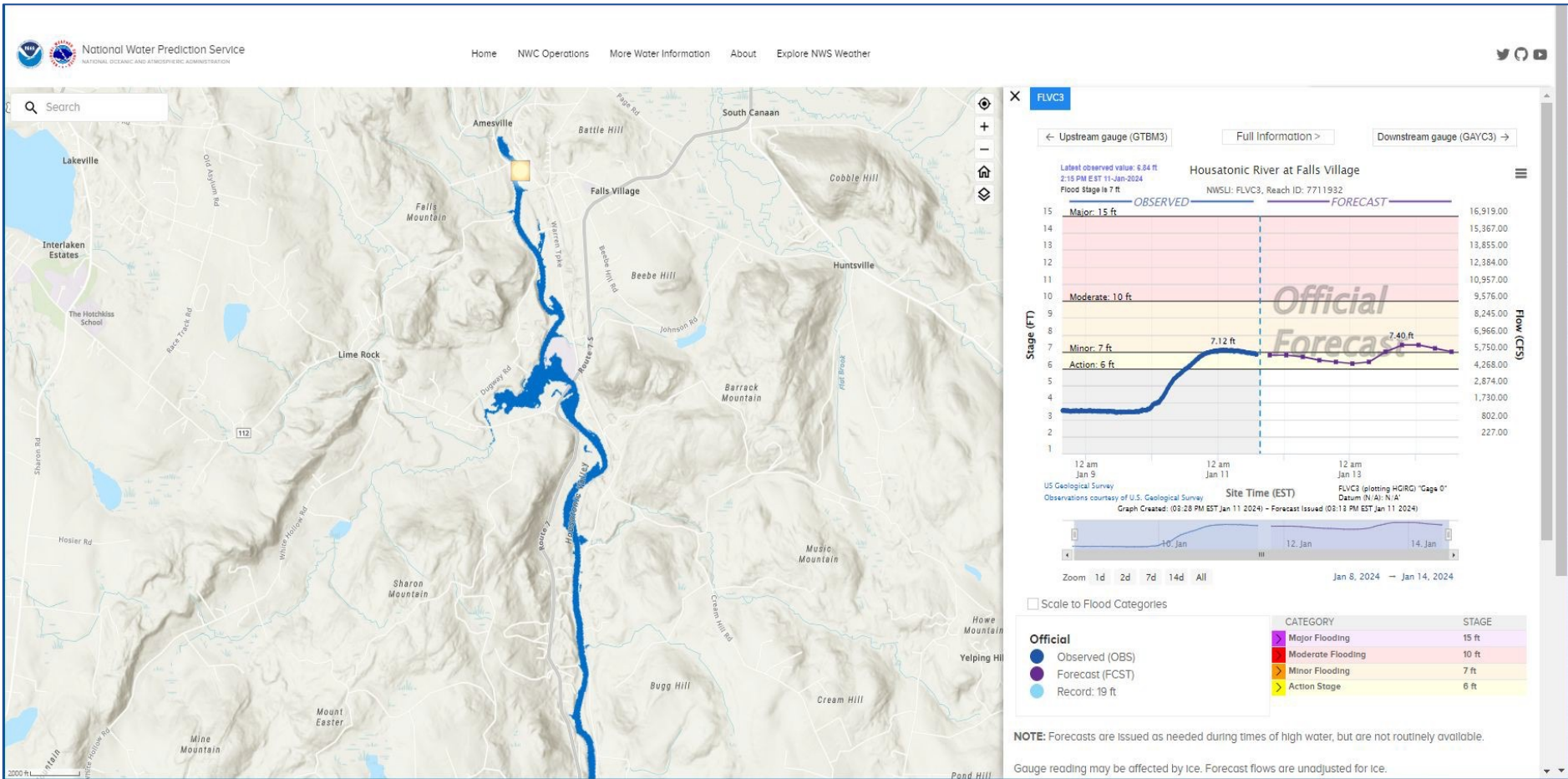
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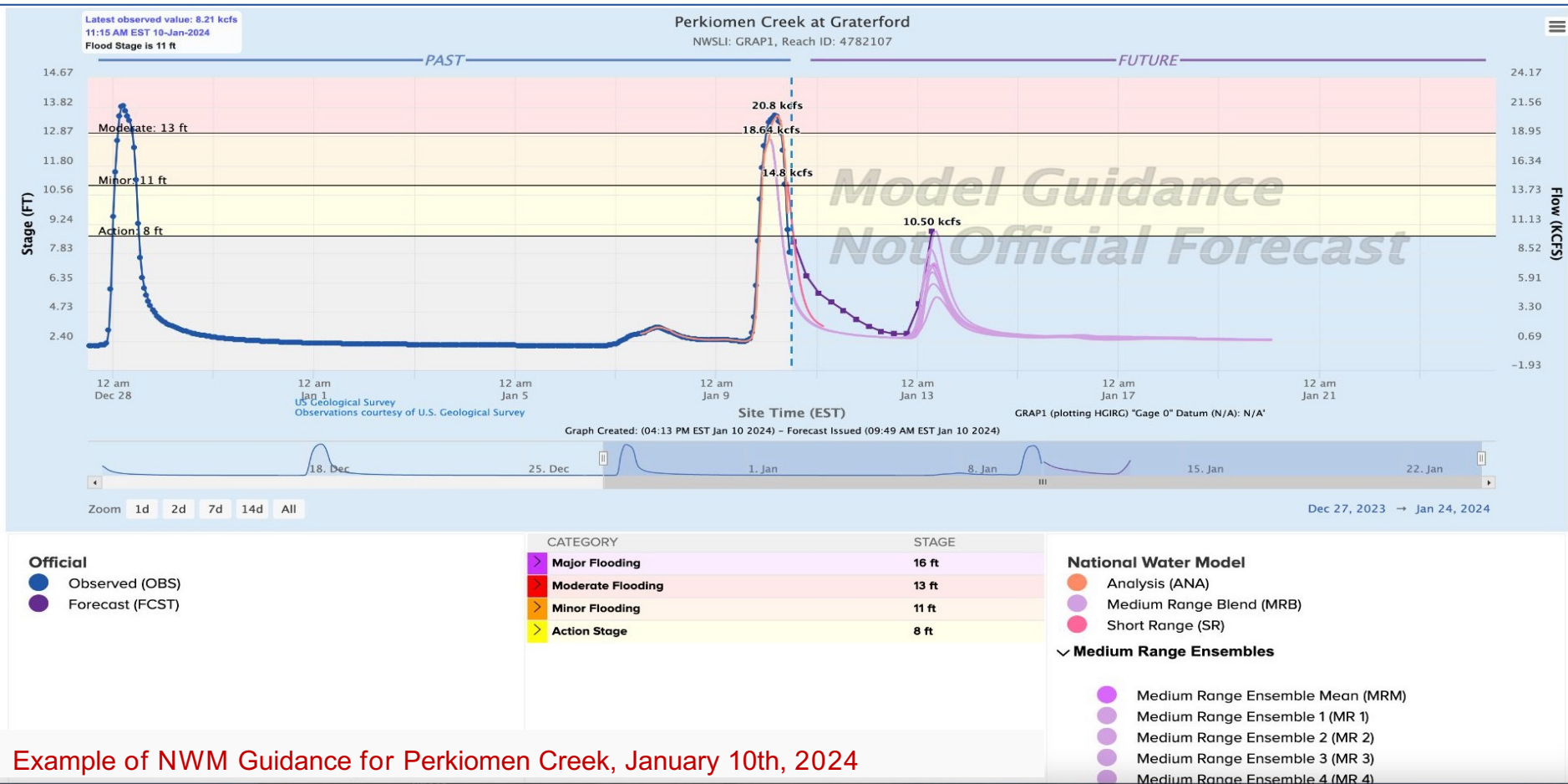
[Help](#) | [Glossary](#) | [Disclaimer](#) | [Information Quality](#) | [Privacy Policy](#) | [Career Opportunities](#) | [Freedom of Information Act \(FOIA\)](#)

[Seasonal Preparedness](#) | [Turn Around Don't Drown](#) | [NWS Education Resources](#)

[Follow us on Twitter](#) | [OWP on GitHub](#) | [Follow us on YouTube](#)



# National Water Prediction Service (NWPS)



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

**Gauge Location**

| NAVD88(ft)                    | Stage(ft) |
|-------------------------------|-----------|
| 29.2                          | 22        |
| 28.2                          | 21        |
| <b>Record Crest: 20.79 ft</b> |           |
| 27.2                          | 20        |
| 26.2                          | 19        |
| 25.2                          | 18        |
| 24.2                          | 17        |
| 23.2                          | 16        |
| 22.2                          | 15        |
| 21.2                          | 14        |
| 20.2                          | 13        |
| <b>Major</b>                  |           |
| 19.2                          | 12        |
| 18.2                          | 11        |
| <b>Moderate</b>               |           |
| 17.2                          | 10        |
| 16.2                          | 9         |
| <b>Minor</b>                  |           |
| 15.2                          | 8         |
| <b>Action</b>                 |           |
| 14.2                          | 7         |
| <b>Low</b>                    |           |
| 13.2                          | 6         |
| <b>Study Boundaries</b>       |           |
| Factory Levee (WWTF) Breach   |           |
| - 16.2 ft NAVD88              |           |
| [ ] Inundation WWTF Breach    |           |
| - 17.2 ft NAVD88              |           |
| [ ] Inundation WWTF Breach    |           |
| - 18.2 ft NAVD88              |           |
| [ ] Inundation WWTF Breach    |           |
| - 19.2 ft NAVD88              |           |
| [ ] Inundation WWTF Breach    |           |
| - 20.2 ft NAVD88              |           |
| [ ] Inundation WWTF Breach    |           |
| - 21.2 ft NAVD88              |           |
| [ ] Inundation WWTF Breach    |           |
| - 22.2 ft NAVD88              |           |
| [ ] Inundation WWTF Breach    |           |
| - 23.2 ft NAVD88              |           |
| [ ] Inundation WWTF Breach    |           |
| - 24.2 ft NAVD88              |           |
| [ ] Inundation WWTF Breach    |           |
| - 25.2 ft NAVD88              |           |
| [ ] Inundation WWTF Breach    |           |

☒ Display CRAT1 marker  
☒ Deactivate CRAT1 FIM Gauge  
  
☐ Display FEMA's National Flood Hazard Layers

**NAVD88:** 18.2ft Water Level  
**Current opacity:** 65 %

**Current Stage:**  
 5.81 ft at 2024-05-30 11:45:00 UTC  
**Highest Forecast:** -999  
**Current Mouse Location**  
 Latitude: 41.74405  
 Longitude: -71.47539

**Provided in Partnership with**





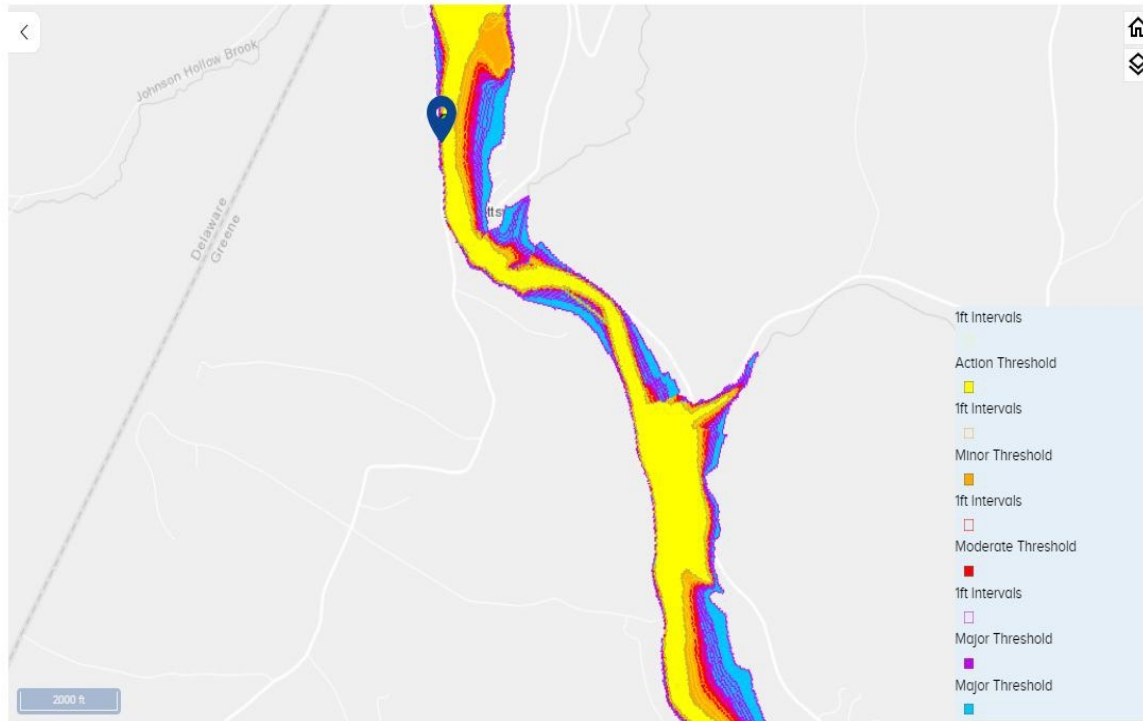

**Disclaimer**

Graphical representation of flood inundation for NWS flood categories are based on steady state hydraulic modeling of water surface elevations for incremental discharges. Map shows approximate inundation areas for given water surface elevations and should not be used for navigation or permitting or other legal purposes, but strictly as a planning reference tool.

# National Water Prediction Service (NWPS)

## Gauge Location

- ☒ Action 1ft Intervals
- ☒ Action Threshold
- ☒ Minor 1ft Intervals
- ☒ Minor Threshold
- ☒ Moderate 1ft Intervals
- ☒ Moderate Threshold
- ☒ Major 1ft Intervals
- ☒ Major Threshold
- ☒ Major Threshold



- ☒ Display PTVN6 marker
- ☐ Activate PTVN6 FIM Gauge
- ☒ 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

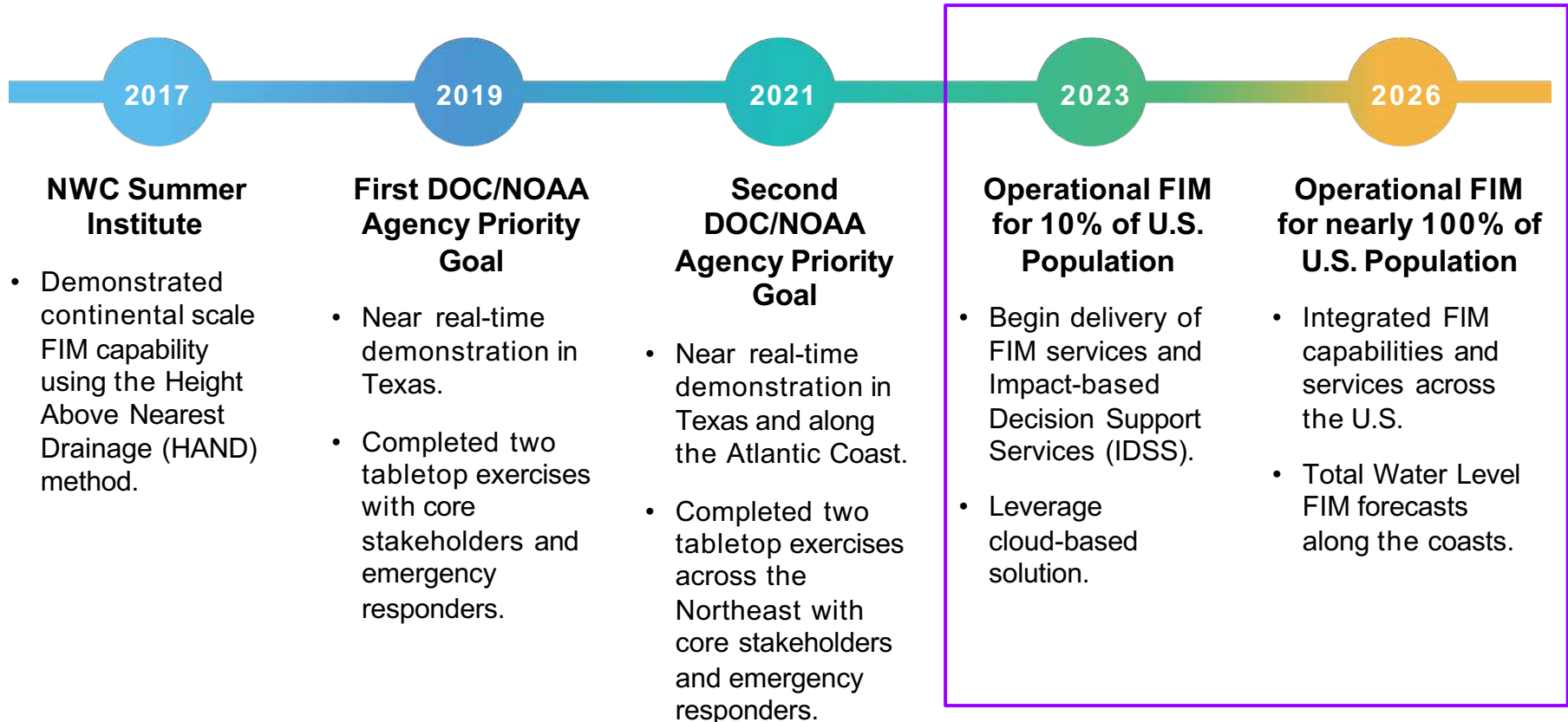
19.5 ft on 01-26-1978

19.39 ft on 01-19-1996

19.14 ft on 10-16-1955

[SHOW ALL CRESTS](#)

# Flood Inundation Mapping Timeline



## Map Legend



Population served by  
**October 2023.**



Population served by  
**October 2024.**



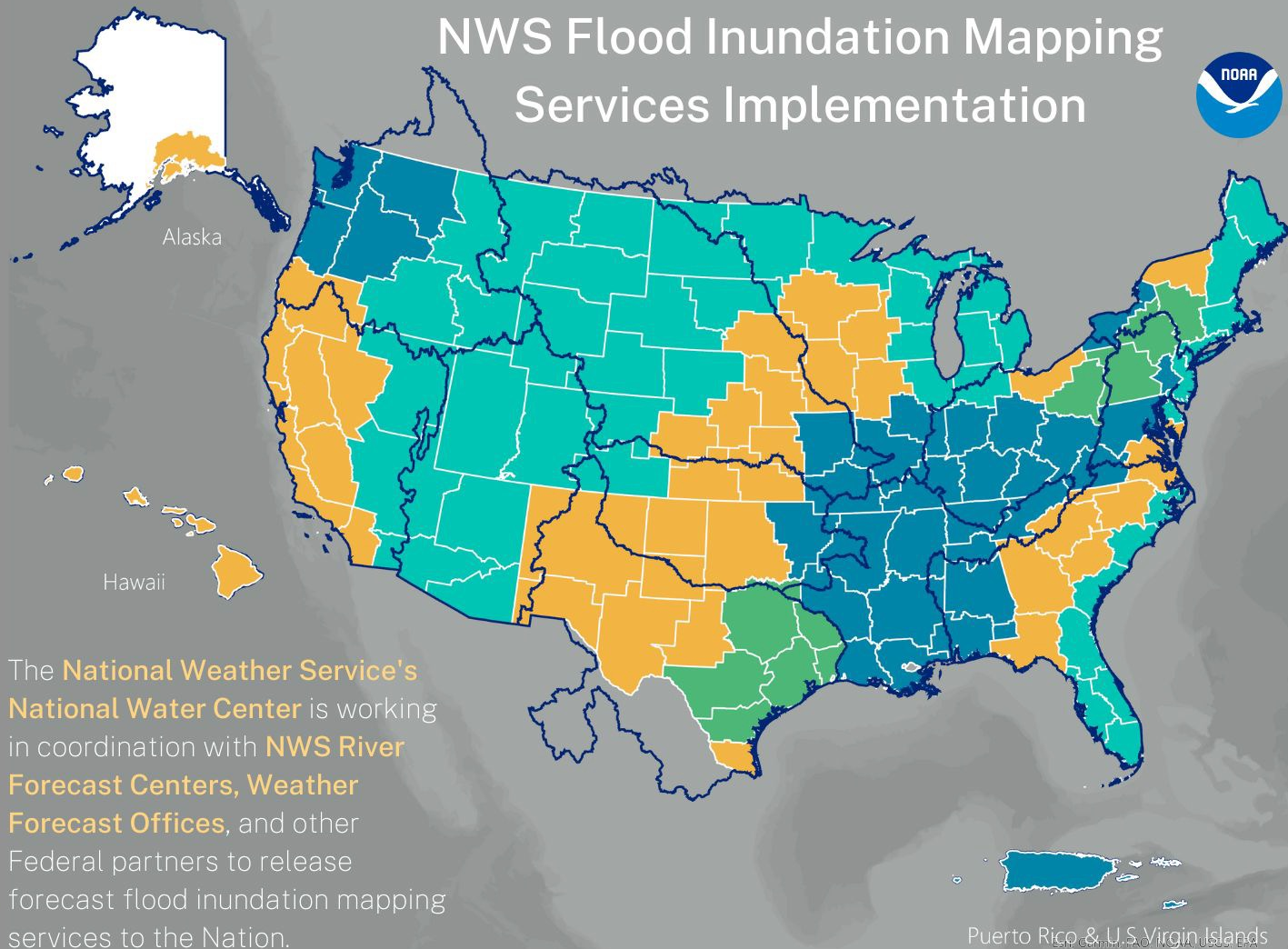
Population served by  
**October 2025.**



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 Method of FIM Services: Height Above Nearest Drainage (HAND)

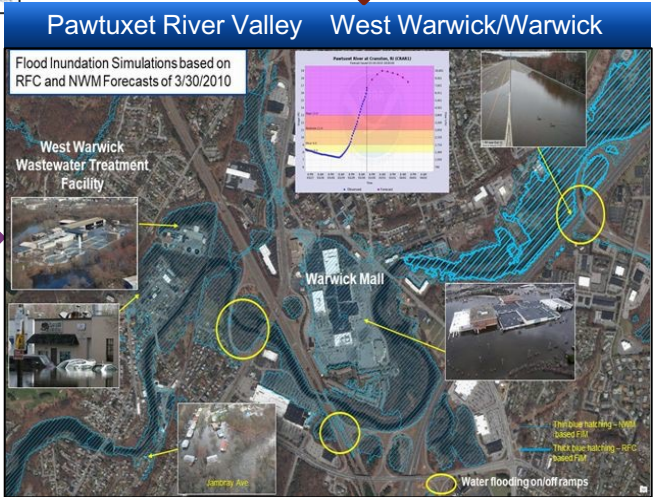
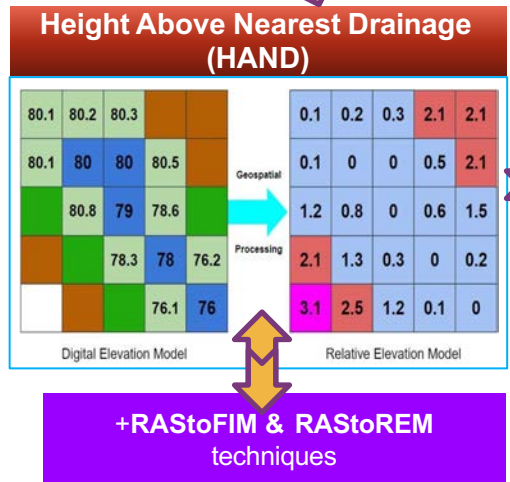
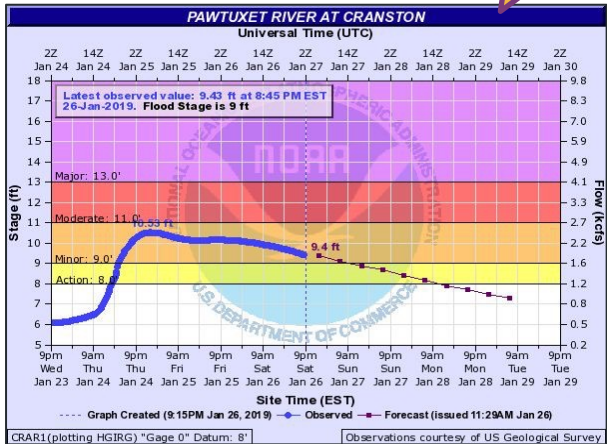
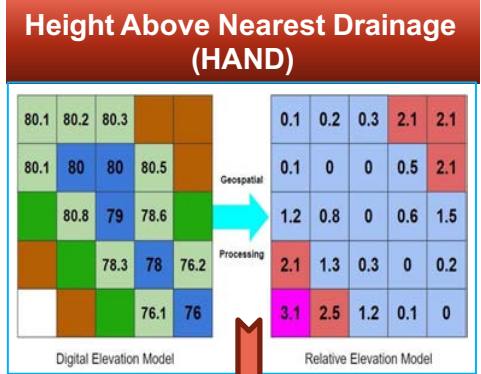
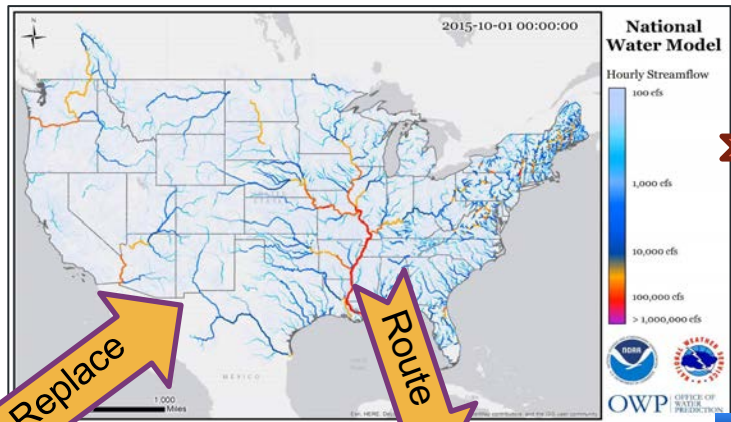
## Deliver Forecast Flood Inundation Services

### National Water Model Guidance

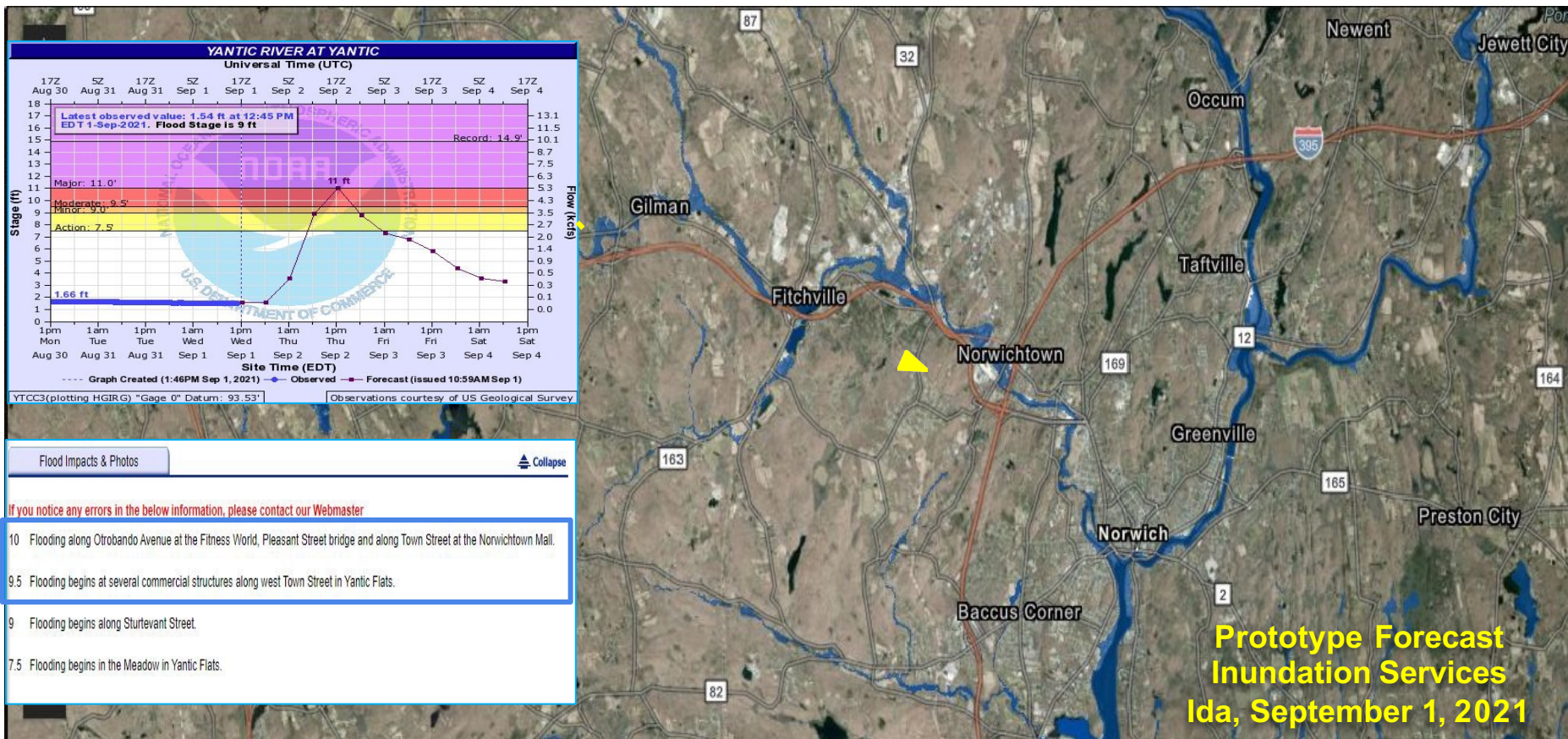
Completely automated process with no forecaster engagement – but provides complimentary guidance on ~3.4 million stream miles nationwide, including Puerto Rico and the Virgin Islands, Hawaii, and by the fall - portions of Alaska

### River Center Forecasts

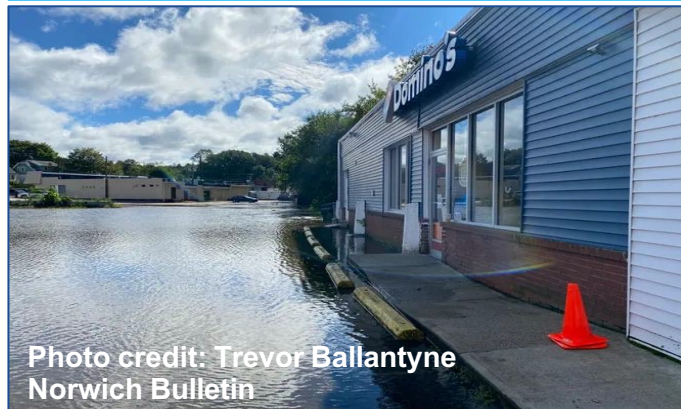
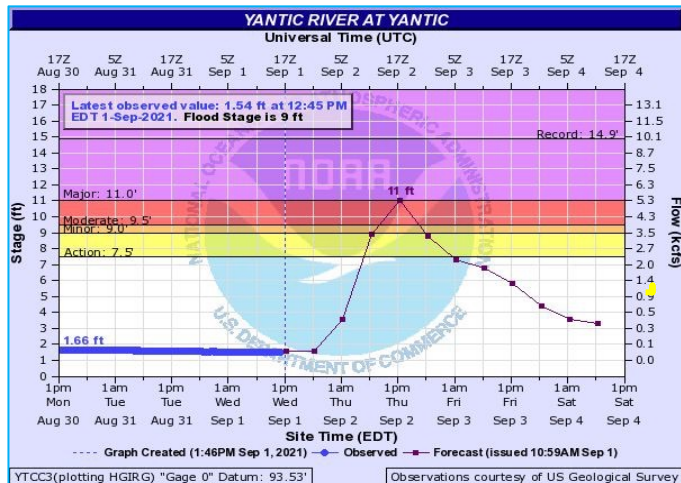
Forecasters heavily engaged in the forecast production



# Value of FIM Services - Visualizations to depict impacts



# Value of FIM Services - Visualizations to depict impacts



# 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

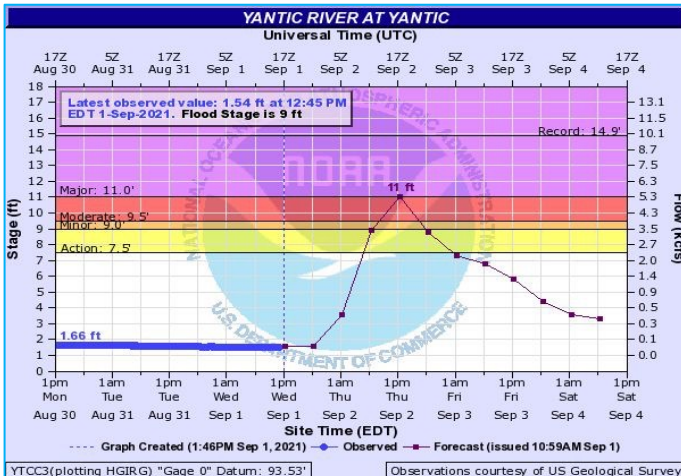
Forecast Crest Height: 11 Feet

Map Height Shown: 11 Feet

FIM Source: RFC FIM 5 Day Max Extent

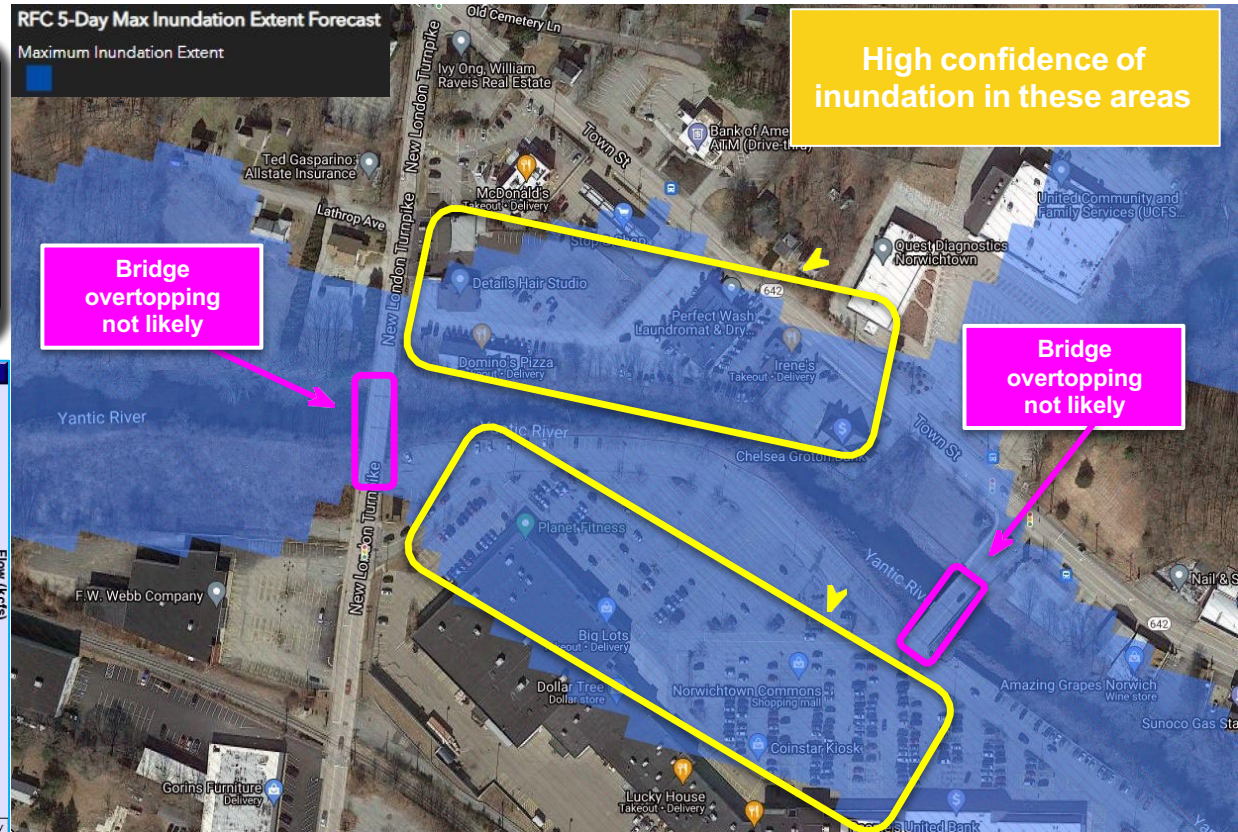
FIM Type: Dynamic (Depth NOT Included)

FIM Creation Time: Sept 1st, 1pm



## RFC 5-Day Max Inundation Extent Forecast

Maximum Inundation Extent



# FIM & NWM Visualizations

## Experimental Services

FIM Services available for 10% of the nation

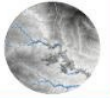
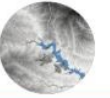
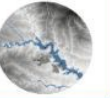
- *NWM Latest Analysis FIM*
- *RFC 5-Day Max Extent FIM*
- *NWM 5-Day Max Extent FIM*

## 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                                                                       | <ul style="list-style-type: none"> <li>• RADAR or gage malfunctions</li> <li>• For ungaged reaches, errors associated with NWM &amp; estimated precipitation</li> <li>• HAND errors [10m DEM resolution]</li> </ul> | <ul style="list-style-type: none"> <li>• Rainfall forecast</li> <li>• RFC flow simulations</li> <li>• Routing of flow using NWM physics</li> <li>• HAND errors [10m DEM resolution]</li> </ul> | <ul style="list-style-type: none"> <li>• GFS forecast</li> <li>• NWM flow simulations</li> <li>• HAND errors [10m DEM resolution]</li> </ul> |  |
| 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                                                                                       |  |

©

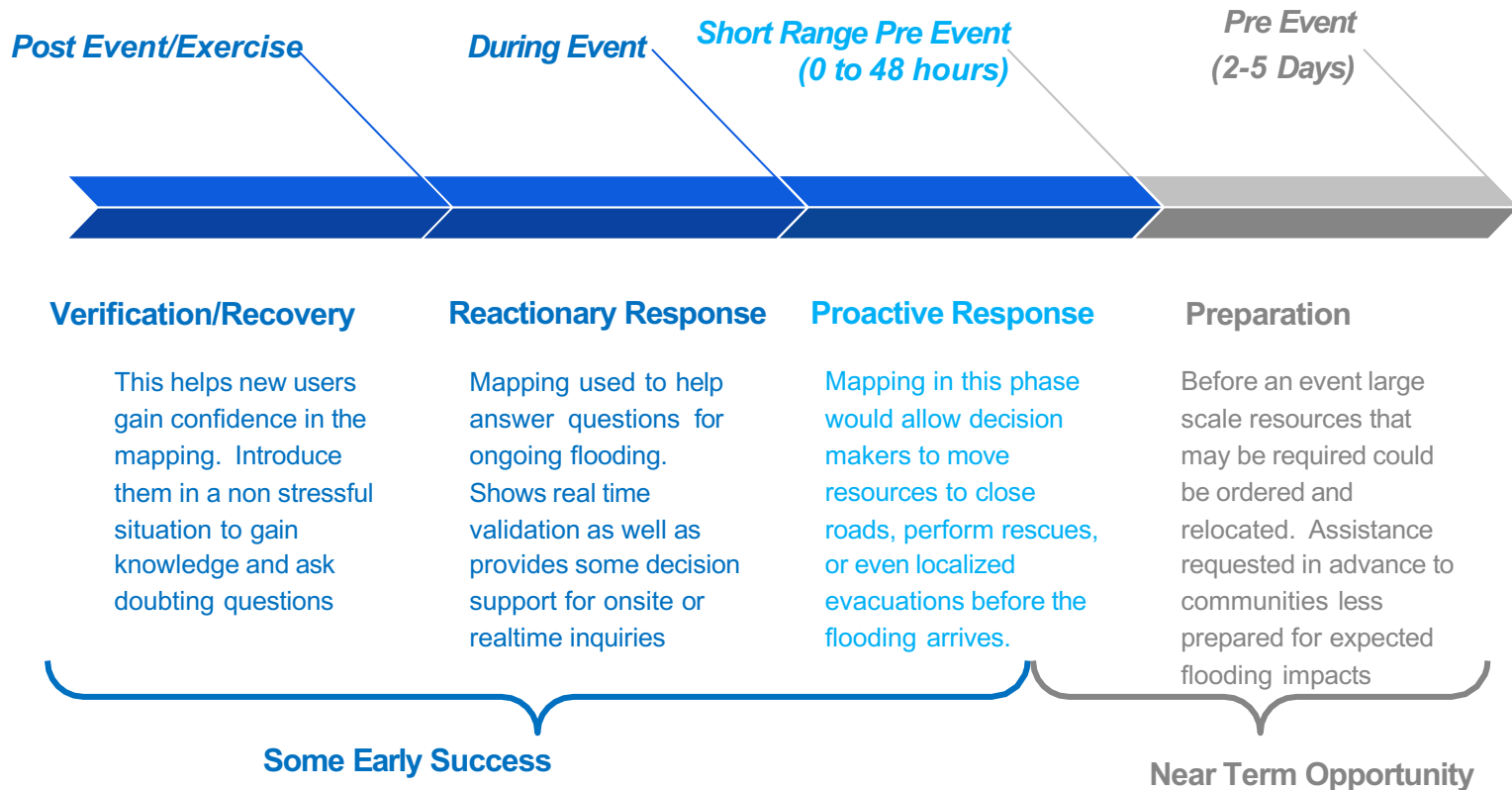
Copyright 2023 of NOAA. Version published 10/2023

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



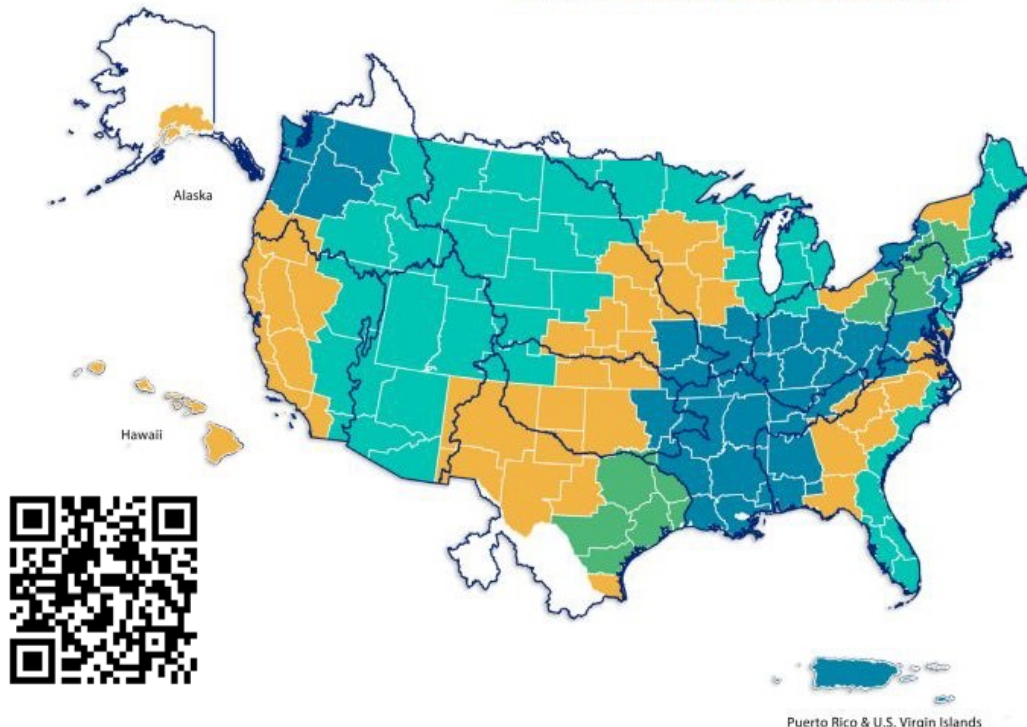
# Tip of the Iceberg

## Other Opportunities for Flood Maps to Benefit Decision Makers



# Phased Implementation Approach Through 2026

## NWS Flood Inundation Mapping Services Implementation



### Map Legend



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

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Operations



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



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***Thank You!***



David R. Vallee



[david.vallee@noaa.gov](mailto:david.vallee@noaa.gov)



<https://water.noaa.gov>