

# Implementation of NOAA's Operational National Water Model for Flood Impact-Based Forecasting

B. Peggy Lee, Darone Jones, and Paula Cognitore

*Water Prediction Operations Division, National Water Center*

*National Weather Service, NOAA*

*Tuscaloosa, AL, USA*



AGU Fall Meeting, December 2021

Session: H052 - Flood Analytics, Operational Forecasting, and Adaptive Flood Management for an Uncertain Future: Challenges and Innovations

# National Water Center: Roles and Responsibilities

## A Catalyst to Transform NOAA's Water Prediction Program

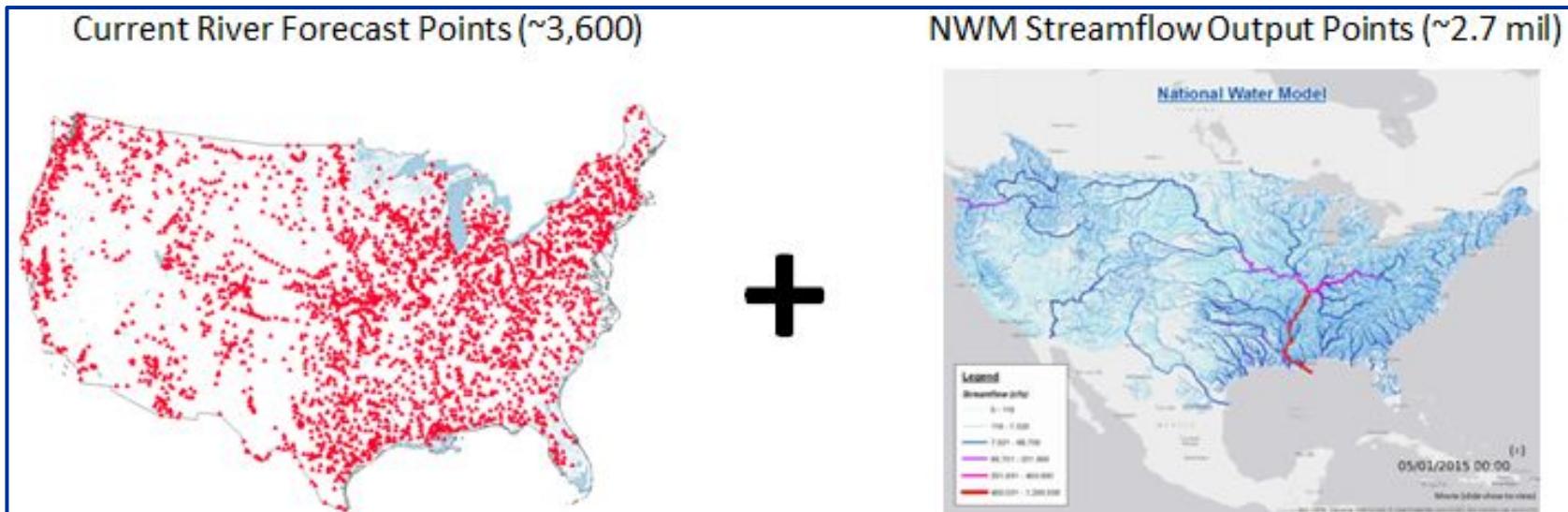
- In collaboration with NOAA field offices and other federal water agencies, NWC is responsible for the delivery of forecast guidance, analyses, and inundation information - as well as other information that augments services provided at local, regional or national levels - for the United States. This includes:
  - Flash Flooding
  - Riverine Flooding
  - Flood Inundation Mapping
  - Winter Hydrology
  - Water Resource Outlooks
  - Decision-support services for emergency and water resources management



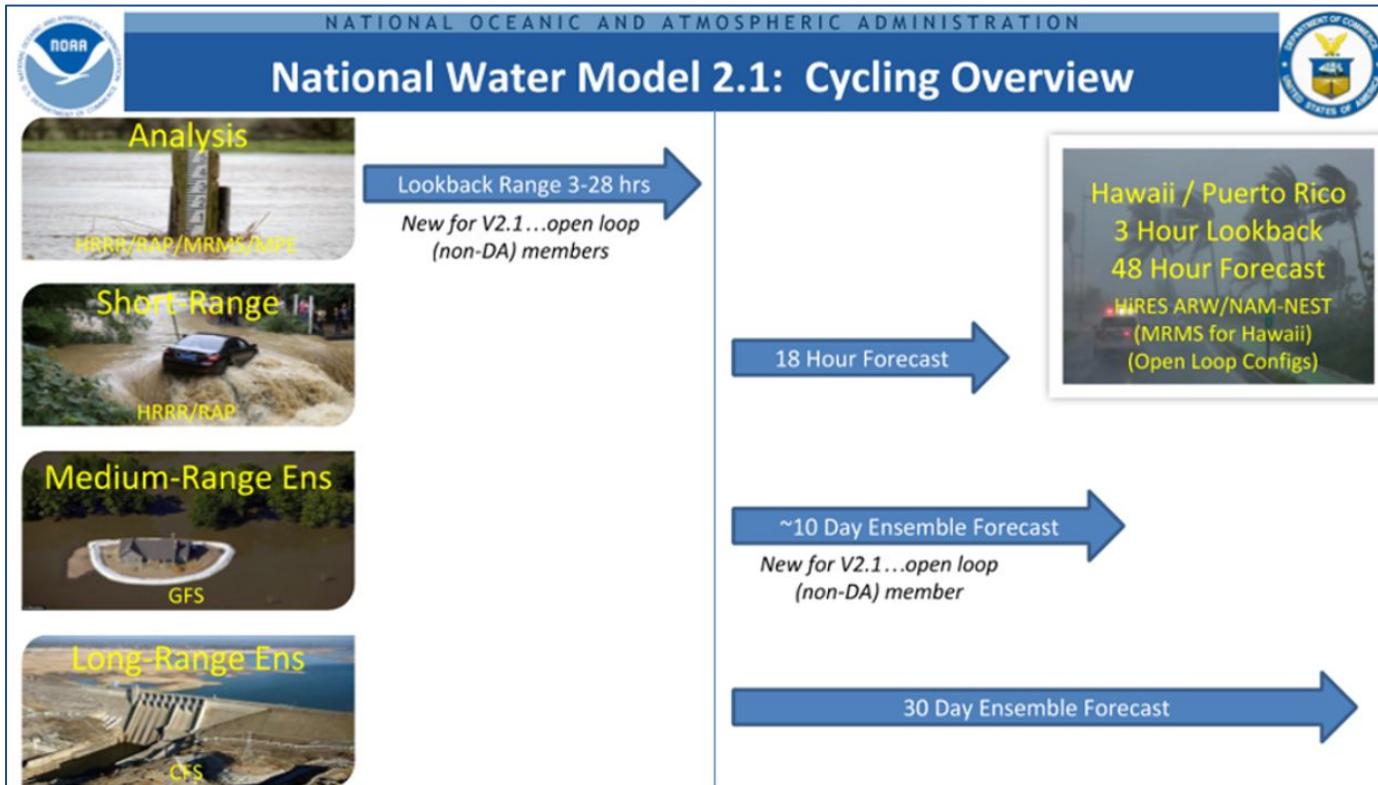
- **Vision** – A “water-ready” nation, capable of addressing the nation’s challenges relating to water extremes, water scarcity, and water quality through improved water prediction and related decision support services
- **Mission** – Collaboratively research, develop and deliver timely and consistent, state-of-the-science national hydrologic analyses, forecast information, data, guidance, and decision-support services to inform essential emergency management and water resources decisions across all time scales.

# National Water Model (NWM)

- NWM is a hydrologic model that simulates observed and forecast **streamflow**
- Compliments official NWS river forecasts provided at approximately 3,600 locations across the CONUS with a very fine spatial and temporal scale and a large spatial coverage (2.7 million river reaches/3.4 million river miles)

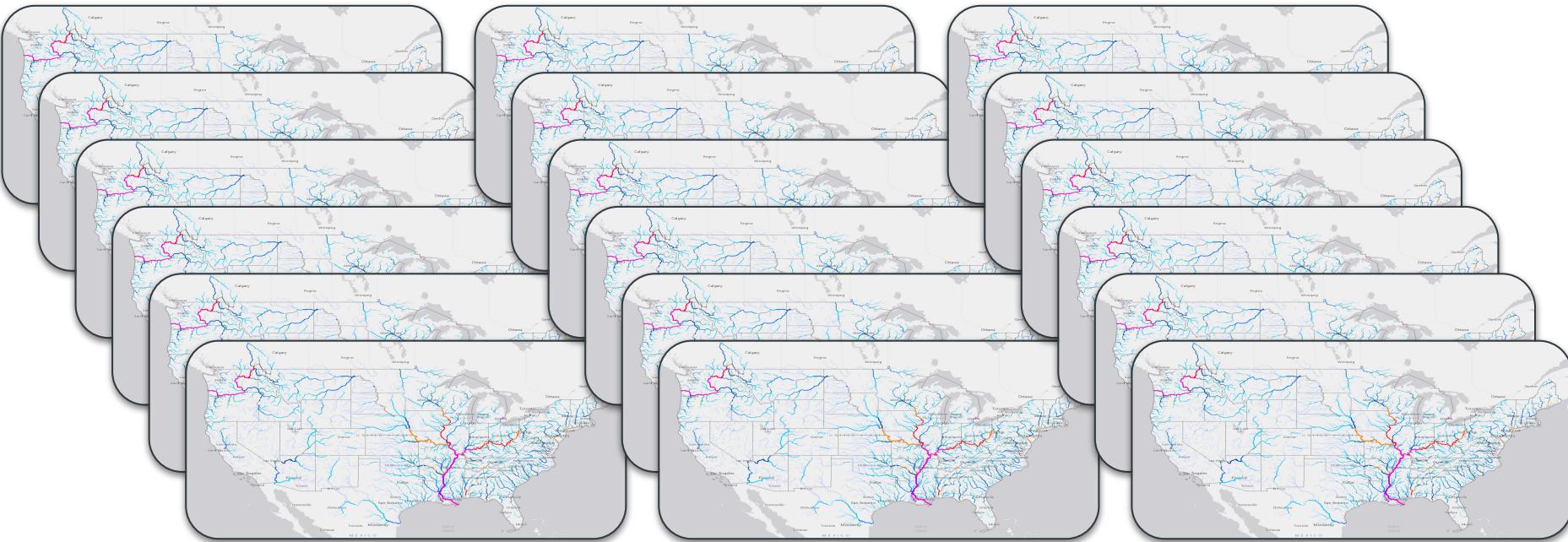


# National Water Model, Cont.



- Visit: <https://water.noaa.gov/>

# 1TB/Day

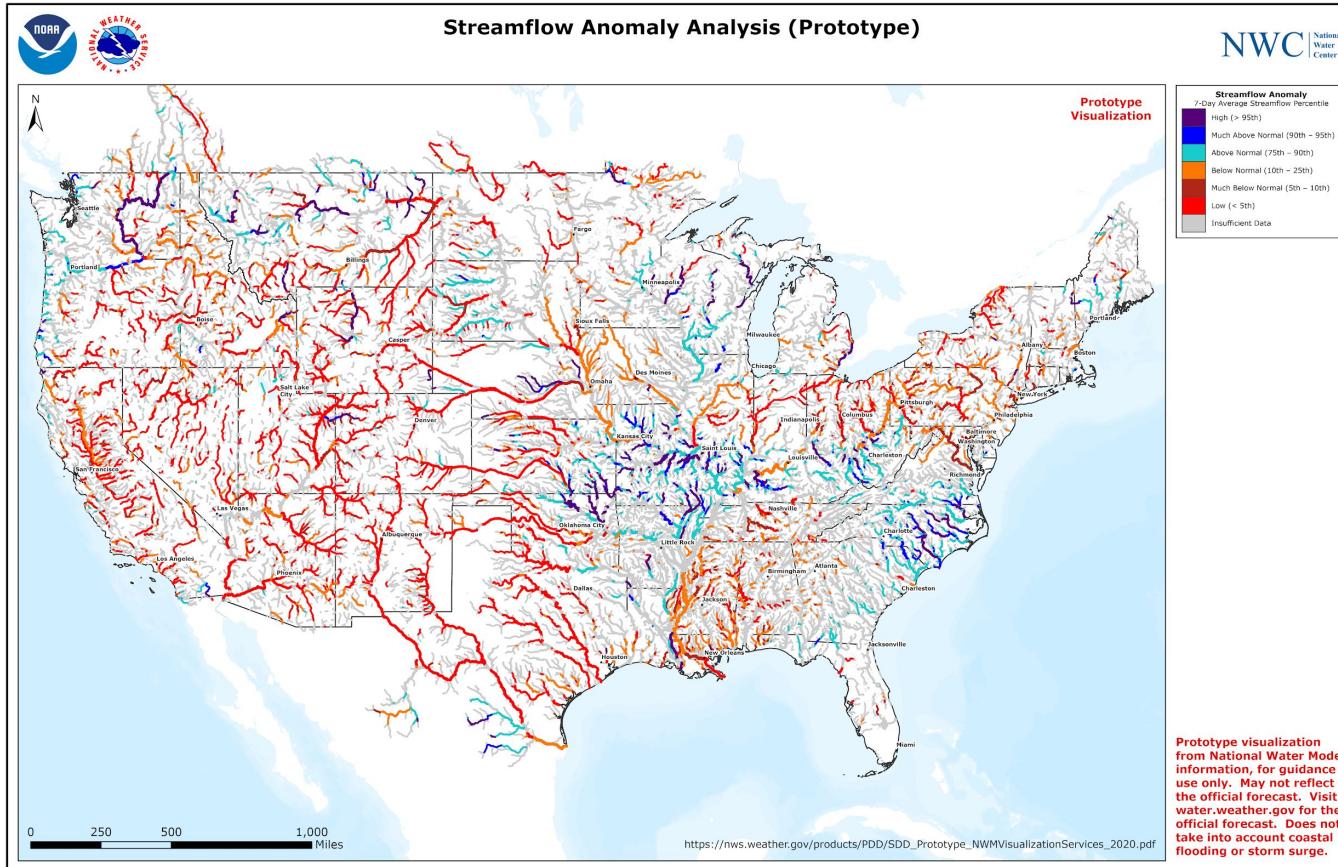


18 time steps x 24 forecasts for  
the NWM Short Range Forecast  
per day

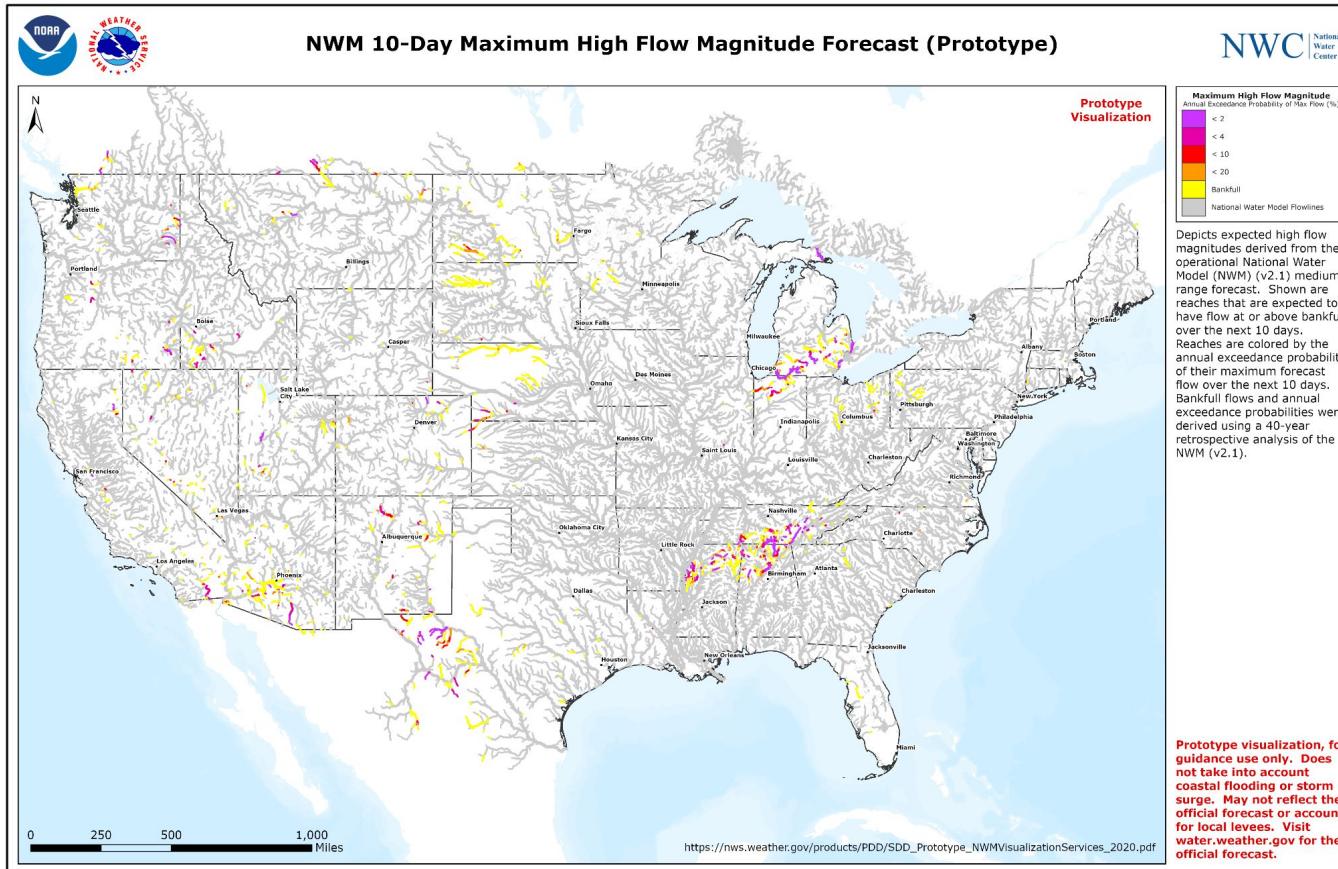
- How do we extract actionable intelligence from that much of data?
- How do we communicate the NWM output to forecasters and decision-makers?



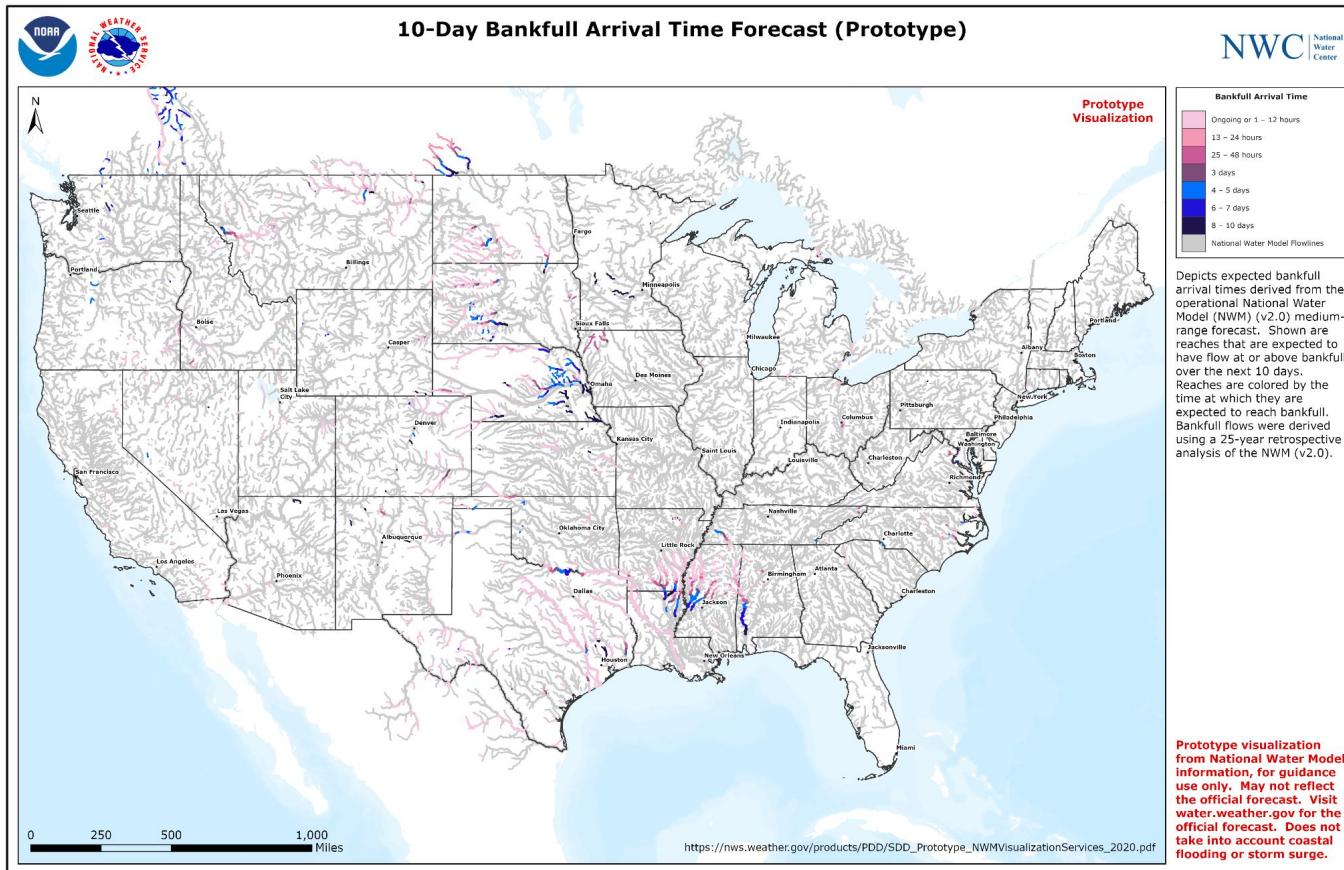
# NWM Streamflow Anomaly Analysis



# NWM 10-Day Max High Flow Magnitude Forecast



# NWM 10-Day Bankfull Arrival Time Forecast

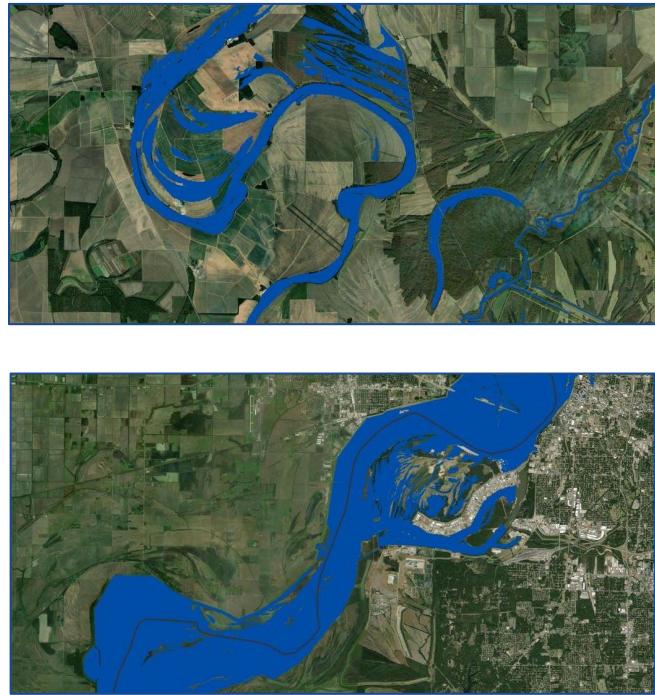
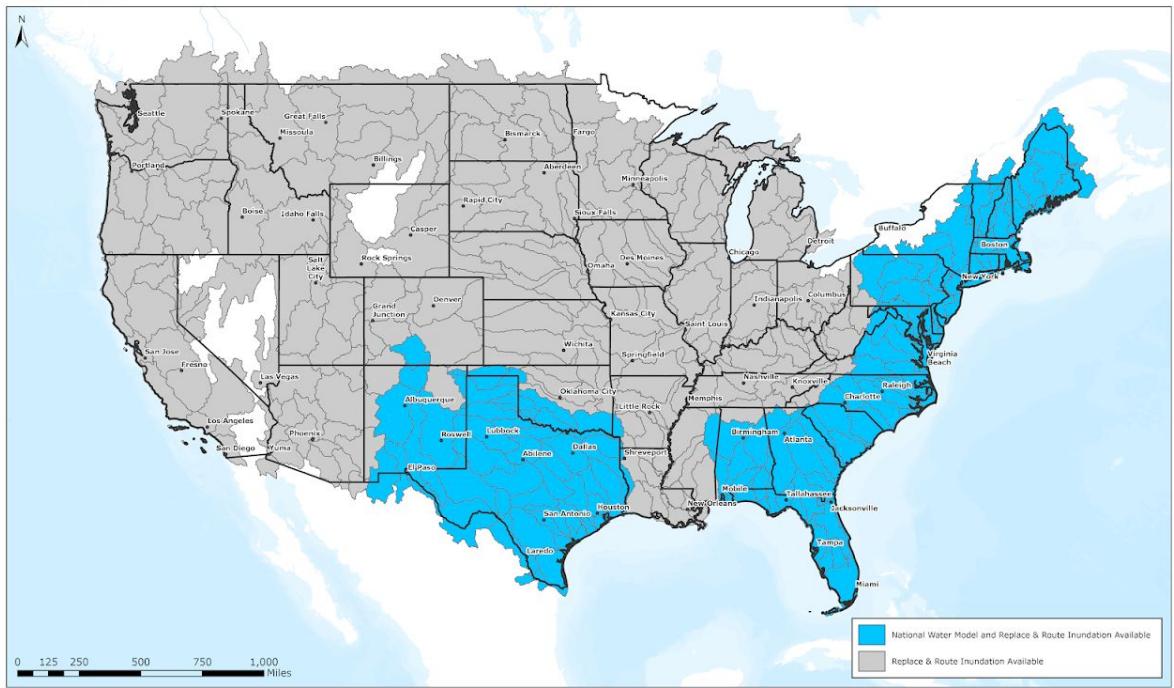


# Flood Inundation Mapping



National Water Center Inundation Availability Extent

NWC  
National Water Center



# National Hydrologic Discussion (NHD)

- Forecast **discussion** for observed, modeled, and expected hydrologic conditions for the United States days 1-10
  - NOT a National Water Model (NWM) diagnostic discussion
  - Uses all available resources and forecaster knowledge to produce
- Audience: Provide internal and external partners IDSS guidance for the expansive U.S. streamflow network
- Will be available at 15:30Z
- Anticipated as a routine public product issued twice daily

National Hydrologic Discussion (NHD)

PROTOTYPE DISCUSSION

National Hydrologic Discussion #0379  
NWS National Water Center Tuscaloosa AL  
Issued 10:15 AM CDT Tuesday, September 28, 2021  
Valid 09280600Z - 10080600Z

**Synopsis...**  
Locally heavy rain and potential hydrologic impacts in the Texas and Lower Mississippi Valley and Central Plains. Potential flooding impacts continue in the Desert Southwest and Puerto Rico... Recessions dominate in rivers with Ongoing Flooding...

**Discussion...**

**Texas and Lower Mississippi Valley...**  
An extended period of potentially locally heavy rainfall developing across portions of TX and the Lower Mississippi Valley will increase the threat of flash, urban, and small stream flooding across the region today into the weekend. Across TX, soils are dry and initial rounds of rainfall through day 3 (Thu) will help to increase soil moisture and enhance runoff and flash flooding potential into the weekend. Streamflows in this area range from below normal over central and western TX, to normal over eastern TX which will mitigate hydrologic responses along the larger rivers and tributaries, but small creeks could see out-of-bank flows following intense storms. The GFS-forced National Water Model (NWM) Medium Range Forecast (MRF) continues to signal the potential for small stream bankfull and higher flows expanding in areal coverage



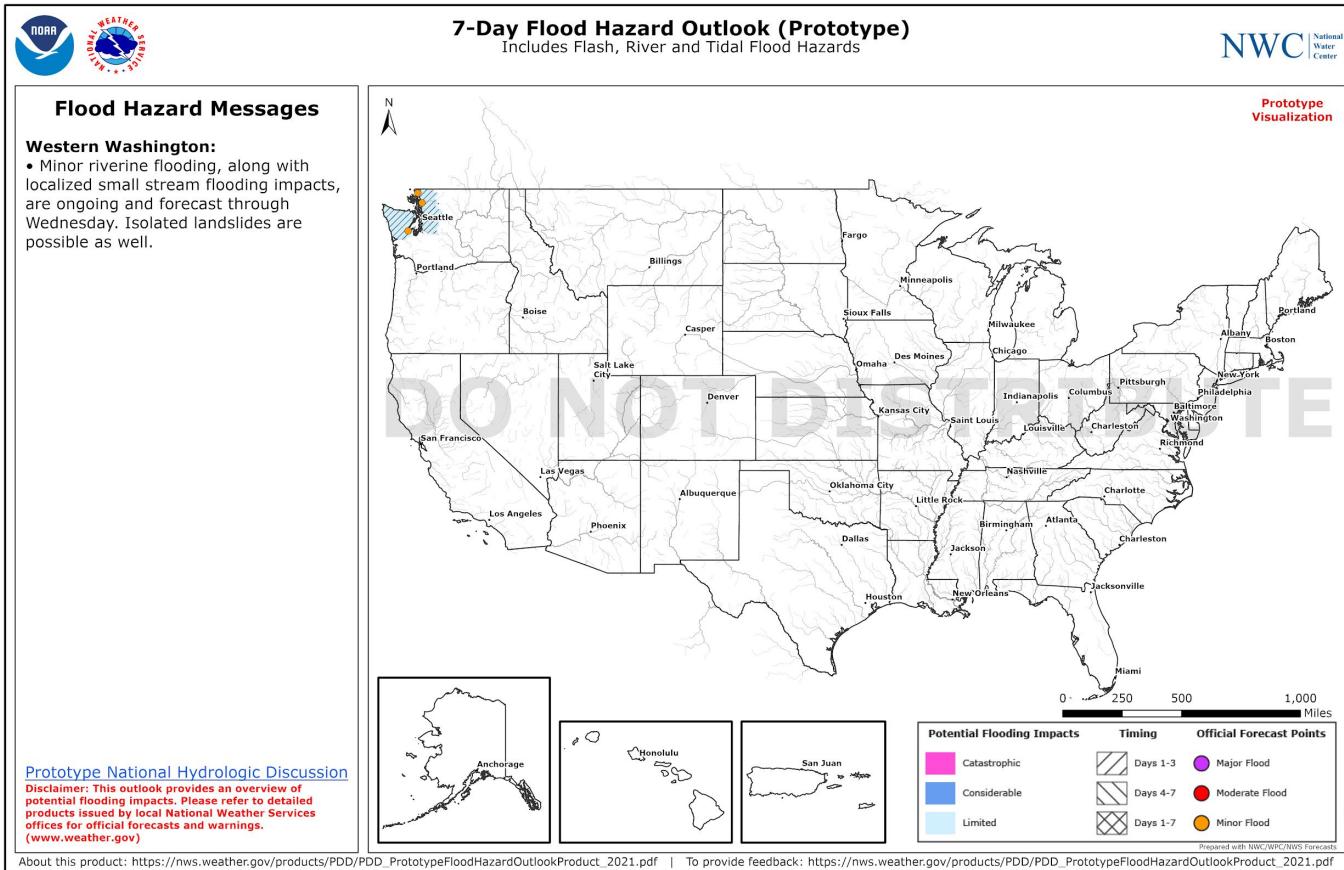
# Flood Hazard Outlook (FHO)

---

- High level, graphical depiction of potential inland flood impacts (both flash and river flooding) for the next seven days with key messages
  - Began in 2020 as Atlantic basin Tropical focus for regional/national briefers
- Audience: NWS stakeholders and water partners at a regional and national level
- National FHO will be issued at 2100Z
  - Atlantic Tropical FHO will be issued at 1130Z and 2100Z
- Future:
  - Sunsetting the Significant Flood Outlook/Flood Outlook Product (FOP)
  - Drive the Graphical Hazardous Weather Outlook (GHWO) for flooding

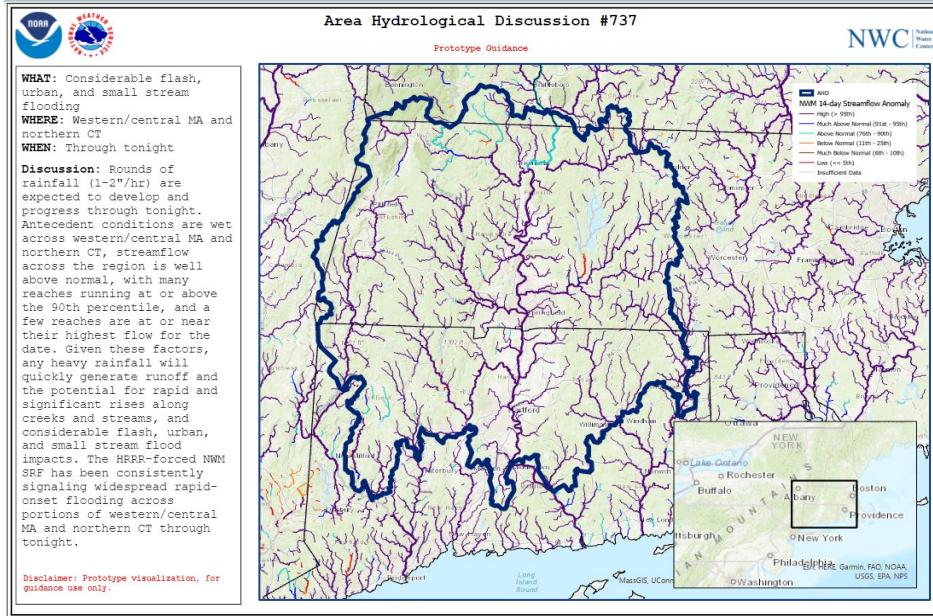


# Flood Hazard Outlook (FHO), Cont.



# Area Hydrologic Discussion (AHD) (Status: Pre-Prototype)

- An episodic product, issued when rapid-onset flooding (ROF) is expected in the **near-term**.
- Audience: NWS offices and core partners



# Summary

- NWM map services and NWC products are vital for flood impact-based forecasting.
  - “Experimental” products becoming available to the public in 2022 to collect comments and feedback.
- Marching towards full operating capability (24/7 operations) in FY 2022.
  - We are hiring ([usajobs.gov](https://www.usajobs.gov), “Tuscaloosa, AL”).
- See you at 1:10 PM on Wednesday, December 15 (Convention Center Rm 267 - 268)
  - What other services and products could be useful?

Learn more about NWM and amazing work conducted at NWC:

- <https://water.noaa.gov/about/nwm>
- **NOAA's National Water Center: Programmatic Update and Opportunities for Collaboration Town Hall**
  - Monday, 6:15 - 7:15 PM
- **Improving Water Prediction in the Coastal Zone Through the NOAA Water Initiative Coastal Coupling Community of Practice**
  - Thursday, 6:15 - 7:15 PM
- **Next-Generation Water Resources Modeling Sessions**
  - Thursday, 12:45 - 6:00 PM (H43D, H44D, H45N, H45O)
  - Friday, 12:45 - 6:00 PM (H53F, H54G, H55U)



- Contact me at [peggy.lee@noaa.gov](mailto:peggy.lee@noaa.gov)

