



NATIONAL
WEATHER
SERVICE

New Horizons for National Water Prediction : Data Visualizations and Services

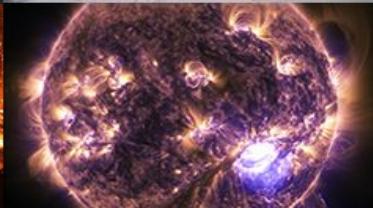
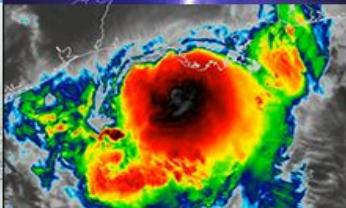
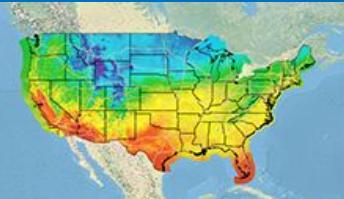
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April 26, 2022





Outline

- Introduction
 - NWS Water Resources Program - Risks and Strategy
 - National Water Model - Overview
- Public Service Delivery - Upcoming
 - National Water Prediction Service (NWPS) web page - Fall 2022
 - National Water Center (NWC) public map services - Summer 2022
 - National Water Center (NWC) new products - Summer 2022
- Public Service Delivery - Future
 - Flood Inundation Mapping - new services
 - National Precipitation Frequency - next generation estimates



NWS Water Resources - Risks

Conference Theme:

Water Risk Under a Rapidly Changing World - Evaluation & Adaptation



- Consistent message from local to national level quantifying risks and impacts





NWS Office of Water Prediction - Strategy

Office of Water Prediction (OWP) Mission:

- Collaboratively research, develop, and *deliver* ... timely and consistent state of the science national hydrologic analyses, forecast information, data, guidance, and equitable decision-support services ... to inform **essential emergency management and water resources decisions** across all time scales.
- **OWP FY21-26 Strategic Plan** available at:
https://www.nohrsc.noaa.gov/owp_files/docs/OWP_Strategic_Plan_FY2021-FY2026_FINAL.pdf

Infrastructure Investments and Jobs Act (IIJA) supports:

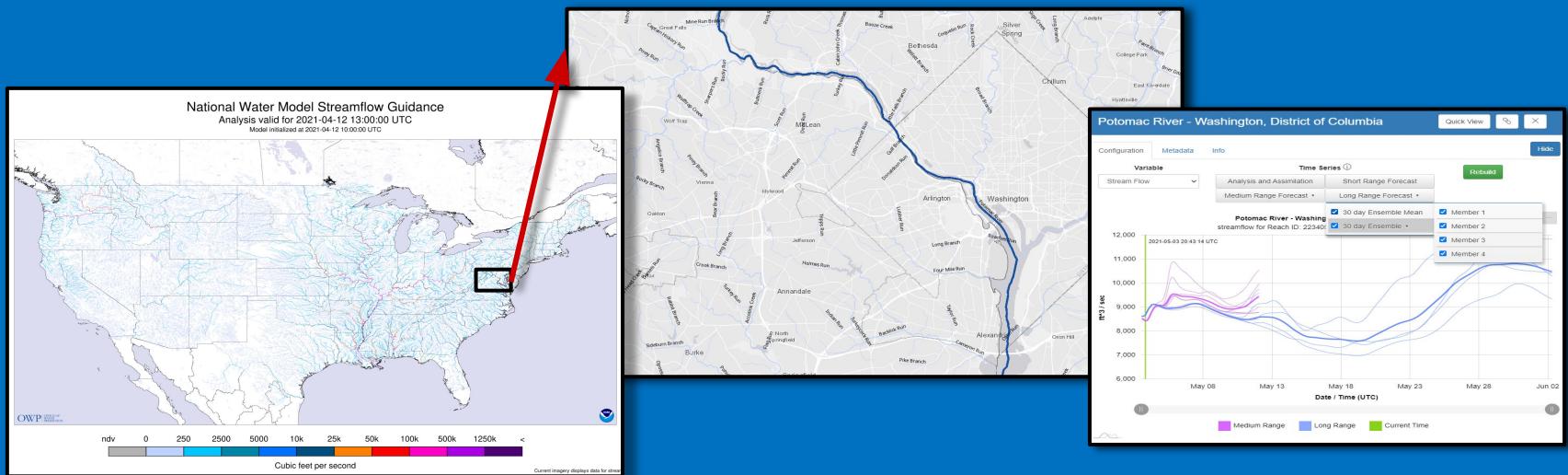
- “... *coastal and inland flood and inundation mapping and forecasting, and next-generation water modeling activities, including modernized precipitation frequency and probable maximum studies*”
- Next-generation water modeling, flood inundation mapping, precipitation frequency estimation





National Water Model (NWM) - Overview

- Continental-scale water resources model providing high resolution, spatially continuous estimates of major water cycle components.
- Operational forecast streamflow guidance for currently underserved locations: complements 3,600 RFC forecast points with guidance for 2.7 million stream reaches.

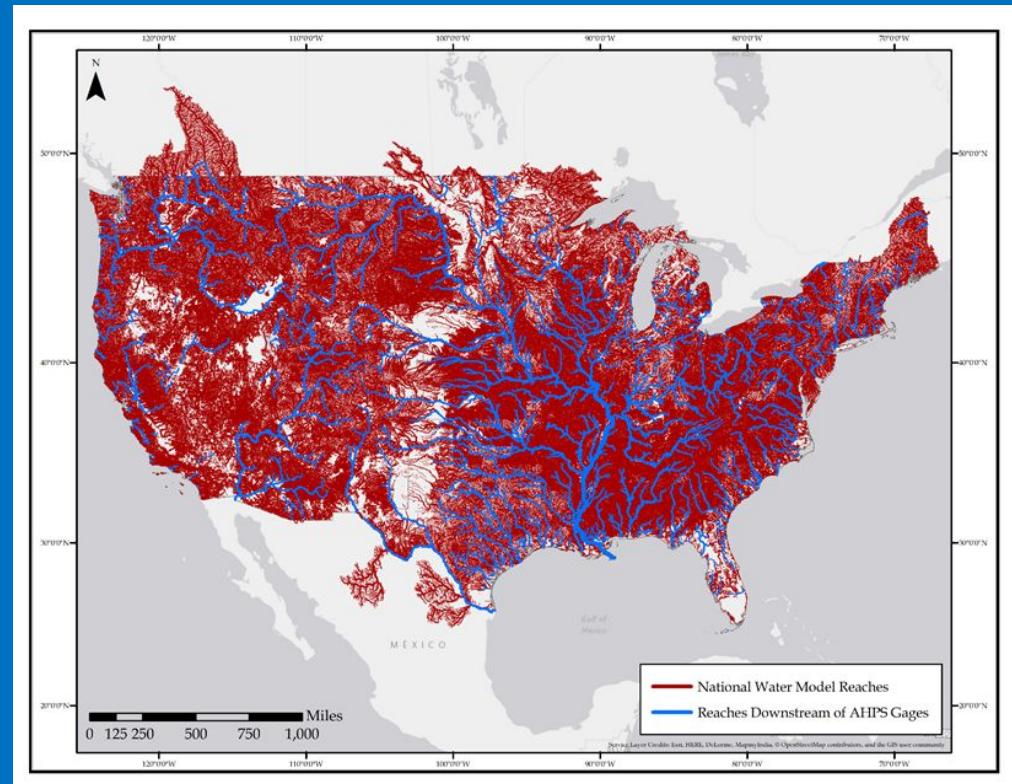




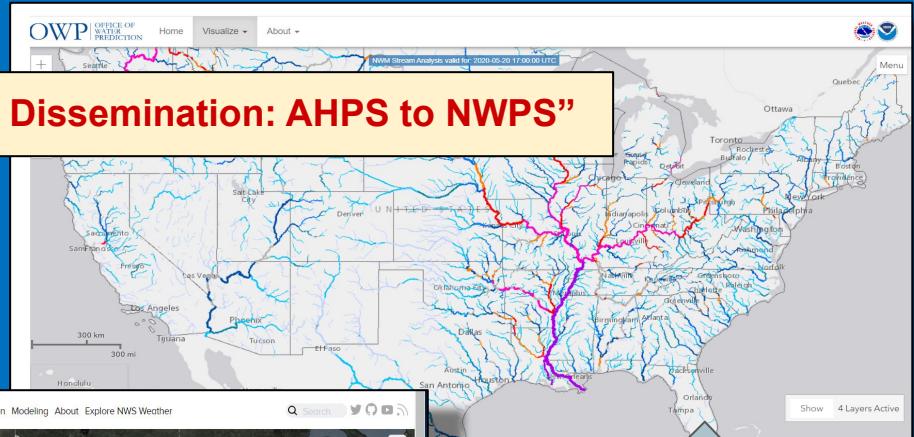
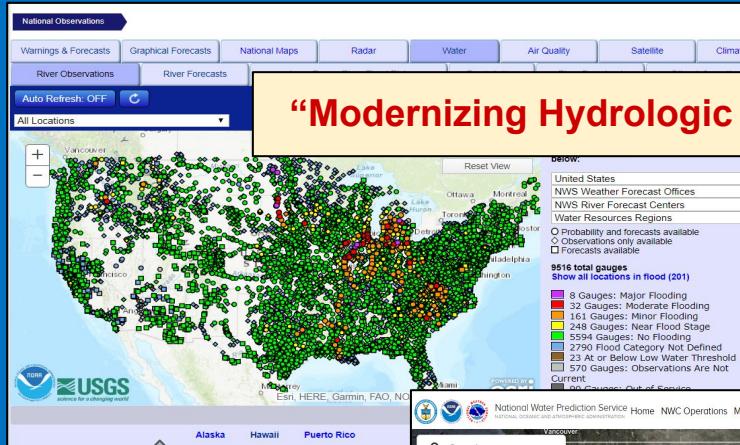
National Water Model (NWM) - Spatial Resolution

- Continental-scale water resources model providing high resolution, spatially continuous estimates of major water cycle components
- Operational forecast streamflow guidance for currently underserved locations:
 - 110,000 river miles to nearly 3,400,000 river miles

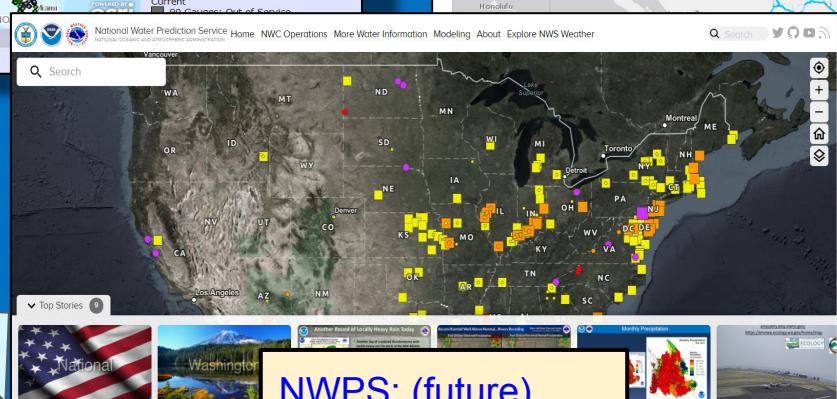
Blue: NWS AHPS Forecast River Reaches
Red: NWM Hydrography Medium Resolution NHDPlusV2



National Water Prediction Service (NWPS)



AHPS:
water.weather.gov



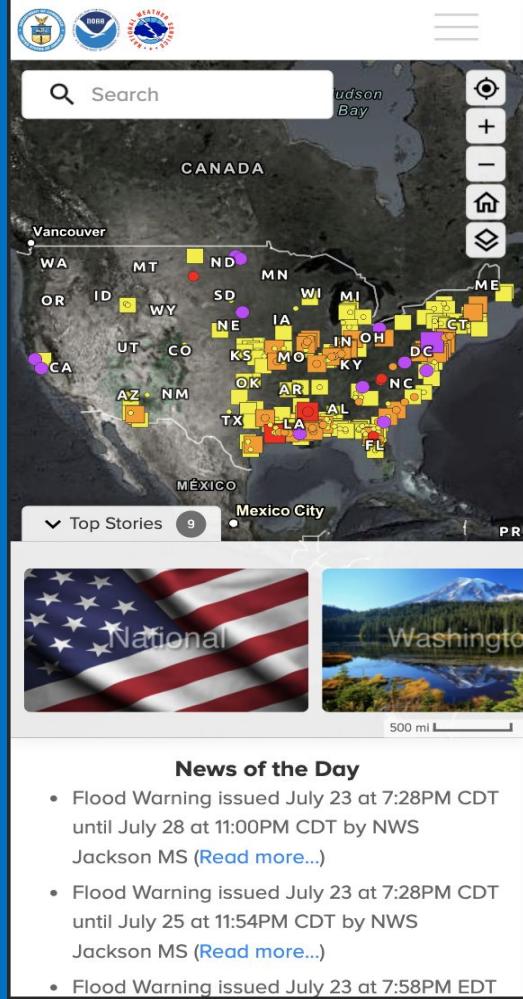
NWPS: (future)
water.noaa.gov

OWP:
water.noaa.gov



NATIONAL WEATHER SERVICE

Building a Weather-Ready Nation // 7



NWPS - Features

- **NWPS consolidates and expands features** of current
 - Advanced Hydrologic Prediction Service (AHPS) and
 - Office of Water Prediction (OWP) web services.
- **Mobile friendly** - user interface supports mobile devices
- **Data services** - web pages are driven by expanded Geospatial & Application Program Interface (API).
 - API leverages the operational NWS Web Services API
 - All data/information currently available on AHPS will also be available via the API (i.e. flood impact statements)
 - Web and data services provide continuous availability
- **Dynamic hydrographs** - no waiting for images to re-generate





NWPS - Features

- **National Water Model guidance** is incorporated into both the spatial map display as well as the river gauge location hydrograph pages.
 - By default, the hydrograph displays the official observations and forecast
- **National Water Center - Operations Center** operational web presence
 - NWC products and other development and operational information
- Improved user experience and navigation for Spatial Displays, Hydrograph Pages, and Inundation Mapping
 - Zoom/Roam spatial displays/maps

NWPS StoryMap : Modernizing Hydrologic Web Dissemination





NWPS - Hydrologic Ensemble Forecasts

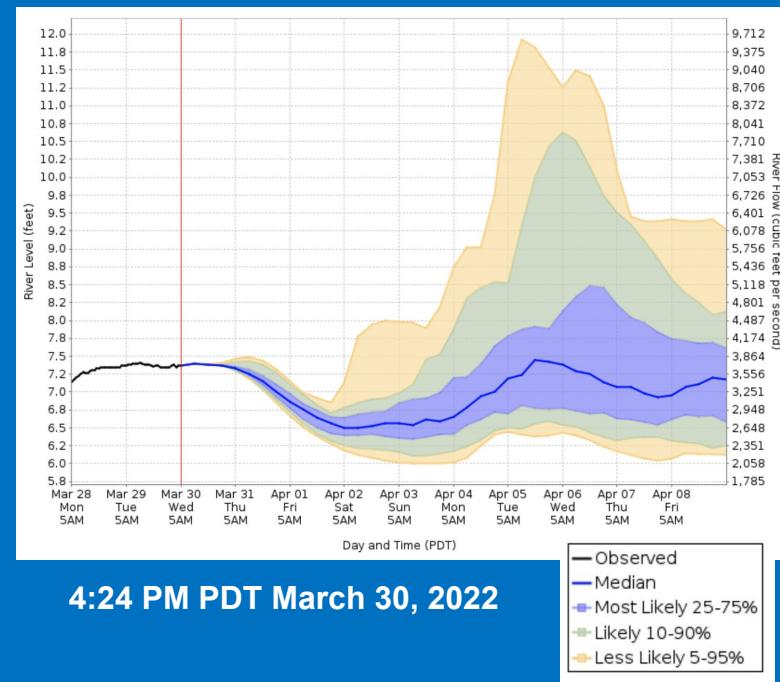
Produce Streamflow Forecasts That:

- Span lead times from one hour to one year
- Skillful, and account for both the meteorological and hydrologic uncertainties
- Inform user's decisions (compatible with Decision Support Systems, e.g. FIRO)

Implementation Status:

- Over 1600 river locations display experimental short and/or long-range products
- Baseline validation completed at more than 2400 river forecast locations
- By May 2023, NWS plans to implement HEFS at more than 3400 service locations

Cowlitz River at Randle, Washington





NWPS - Public Rollout

- **30-Day Parallel Run**

- Scheduled for **May 2022**
- General public can use NWPS and provide feedback
- Feedback reviewed and addressed

- **30-Day Stability Test**

- Currently scheduled for **August - September**
- Public can access
- Final test before deployment - over 30 days

- **Final Deployment/go live** currently scheduled for **October 2022**

- Notifications: <https://www.weather.gov/notification/>





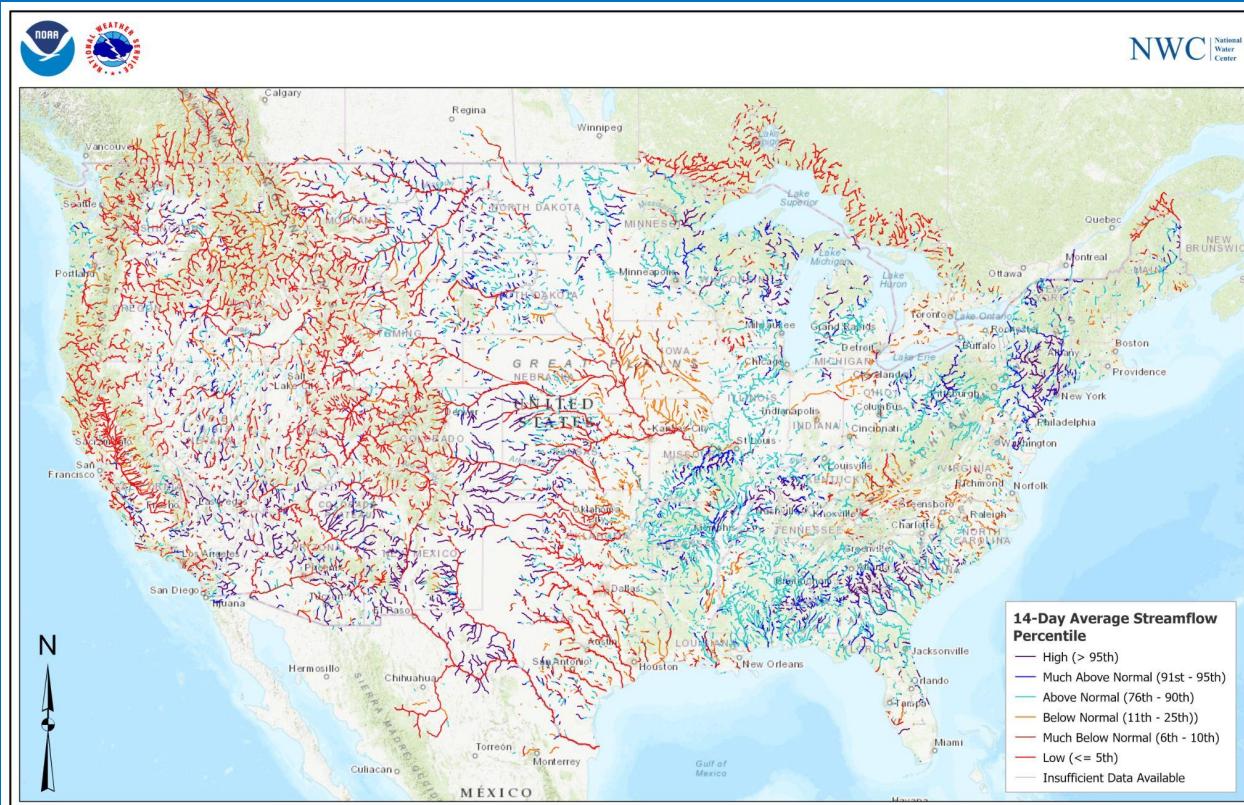
National Water Center - Public Map Services

- New generation of high-resolution national hydrologic forecasts
- Available directly as GIS map services allowing integration into user tools
- Initial public suite is based on forecast discharges from NWM
- Core product suite includes:
 - Streamflow Anomaly Analysis
 - High Flow Magnitude
 - For past 14-Days, next 18-Hours, or next 3, 5 and 10-Day periods
 - High Water Arrival Time
 - Considers 18-hour and 10-Day model period
 - Rapid Onset Flooding Forecast
 - Considers 18-Hour and 10-Day model periods





National Water Center - Public Map Services



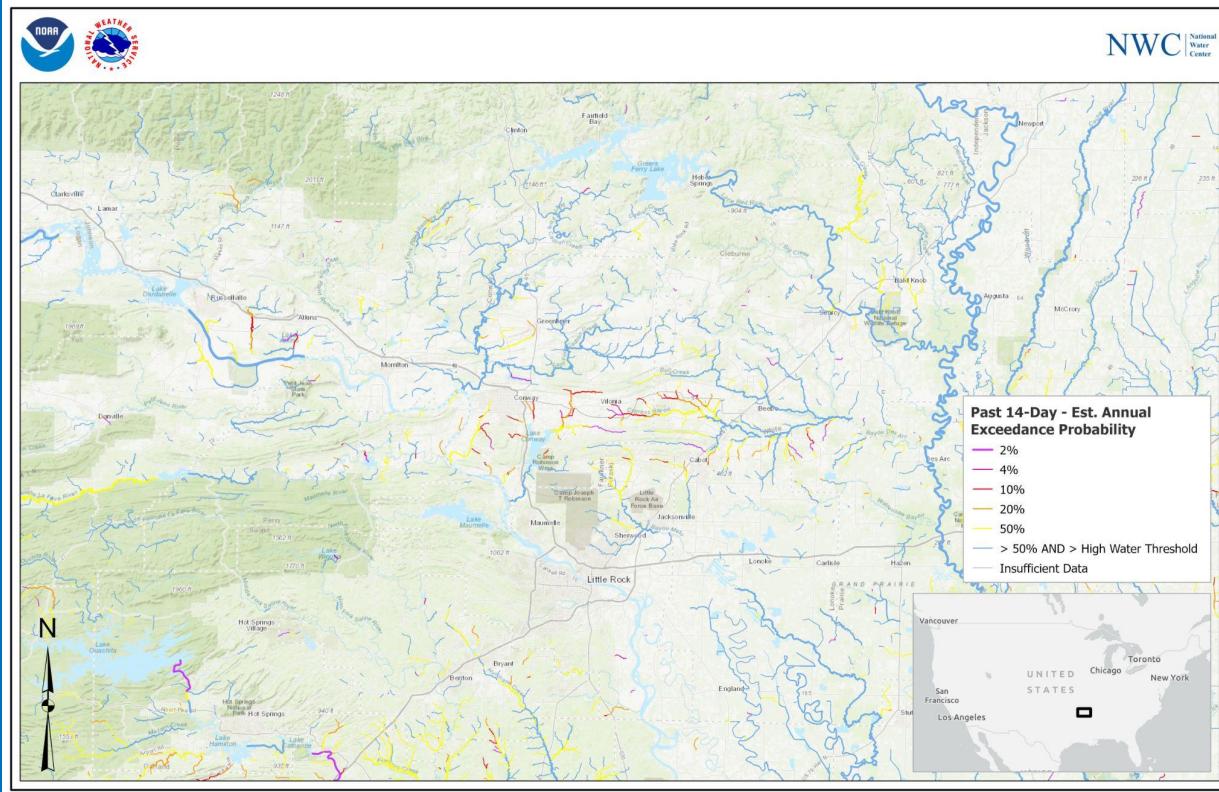
Streamflow Anomaly:

Average streamflow over last 14 days represented as percent of normal flow





National Water Center - Public Map Services



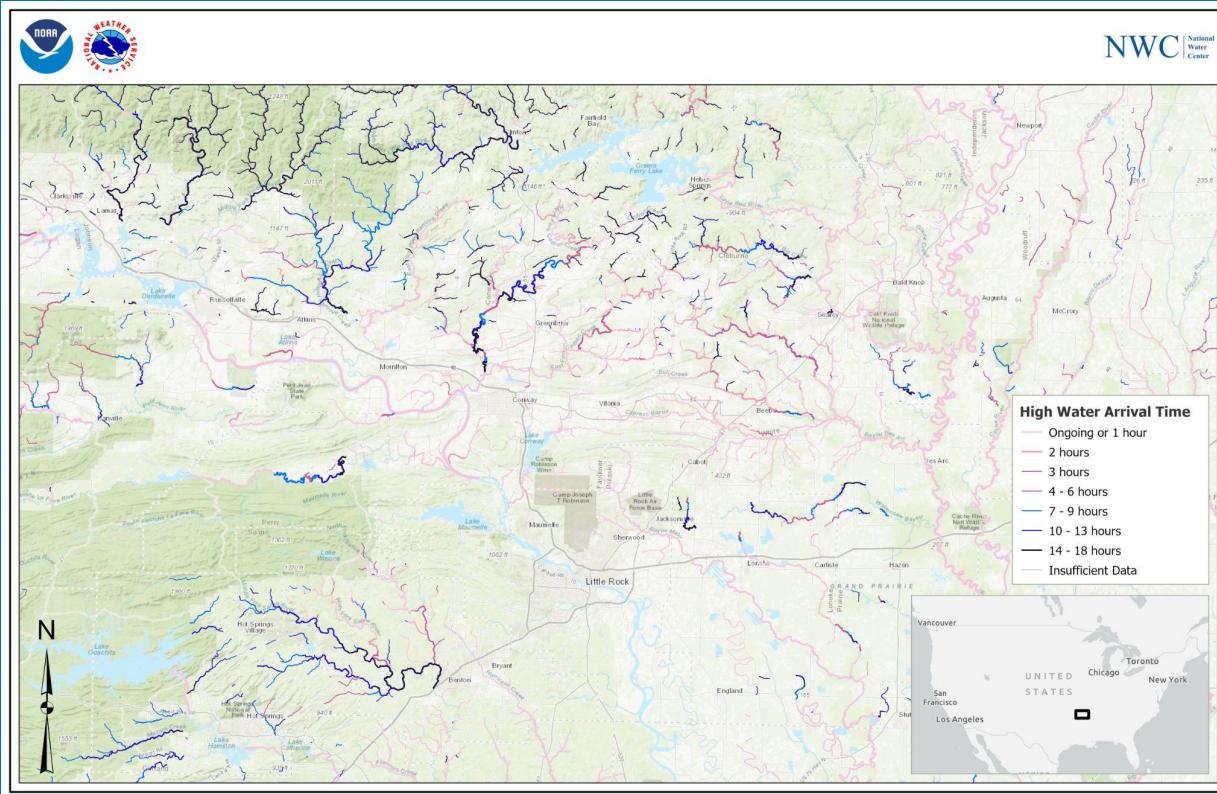
High Flow Magnitude:

Maximum flow over last 14 days represented as percent of normal flow





National Water Center - Public Map Services



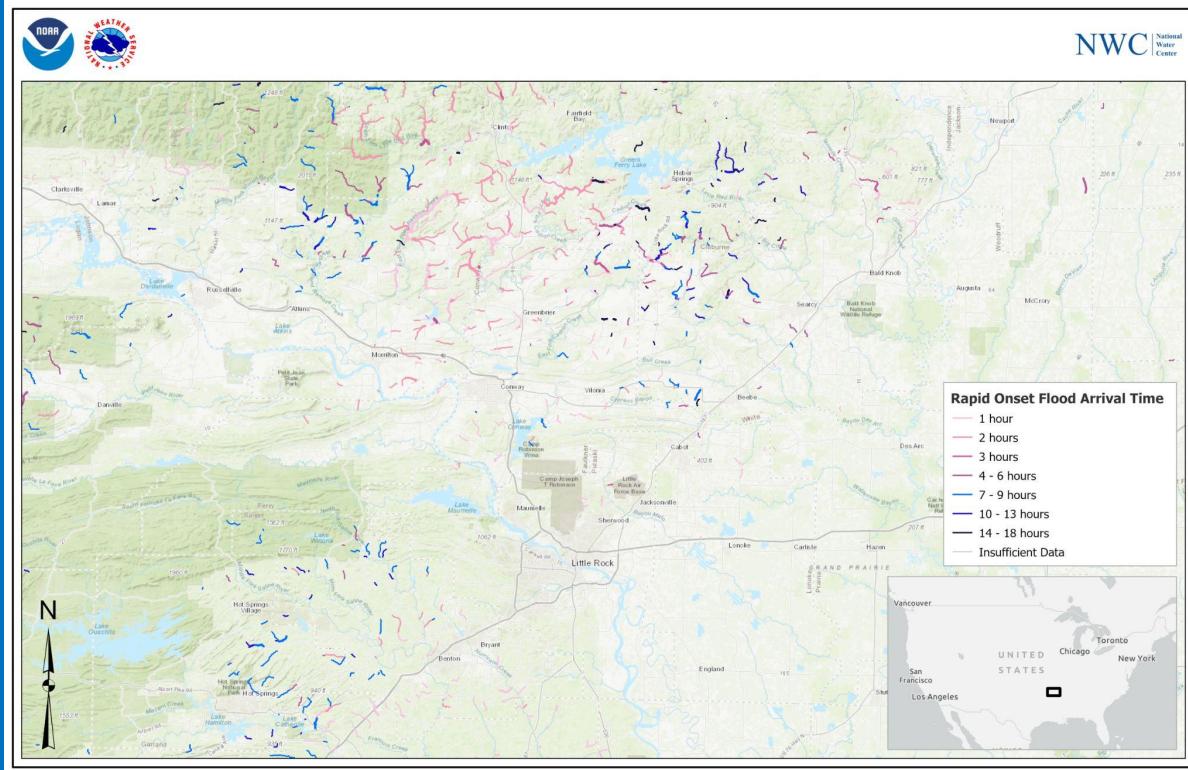
High Water Arrival Time

For next 18 hours,
time that flow begins
to be above high flow
threshold for given
stream reach.





National Water Center - Public Map Services



Rapid Onset Flooding Arrival Time:

For forecast over next 18 hours, stream reaches with flow increase $\geq 100\%$ over an hour, and flow \geq the high water threshold within 6 hours of that increase.

(stream order 4 and below)



National Water Center - New Products

Experimental and publicly available: June 2022

- **National Hydrologic Discussion (NHD)**

- Discussion for observed, modeled, and expected hydrologic conditions for the United States days 1-10.
Issued 1-2x/day

- **Flood Hazard Outlook (FHO)**

- High-level, “heads up” infographic conveying potential flood impacts over the next seven days. National, and Tropical (as needed). Issued 2x/day.

- **Area Hydrologic Discussion (AHD)**

- Short term guidance for locations that may experience rapid-onset flooding, with ideal lead time of 1-6 hours. Event-driven issuance.

PROTOTYPE DISCUSSION

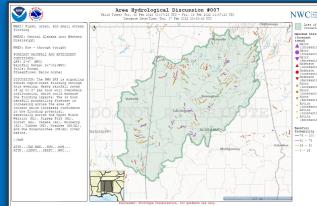
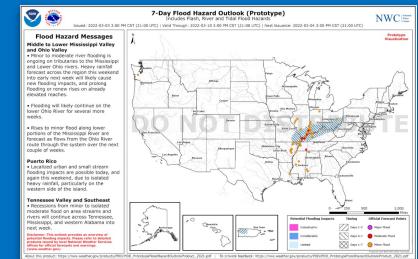
National Hydrologic Discussion #0075
NWS National Water Center Tuscaloosa AL
Issued 10:15 AM CDT Wednesday, March 16, 2022
Valid 03160000Z - 03270000Z

Synopsis...
Ongoing river flooding with potential new flooding impacts late week across the [Gulf Coast and Southeast](#)... Minor river and small stream flooding possible across portions of the [Northeast](#)... River flooding persists in the [Middle to Lower Mississippi and Ohio Valleys](#)... Snowmelt and new bankfull signals this week in the [Upper Midwest and Great Lakes](#)...

Discussion...

Gulf Coast and Southeast...
Minor flooding is ongoing or forecast across portions of the Calcasieu (LA), Pearl (MS/AL), Yazoo (MS), Big Black (MS), St. Mary's (FL), and Santa Fe (FL) rivers in response to recent rounds of rainfall... Most rivers will remain in minor flood through early next week.

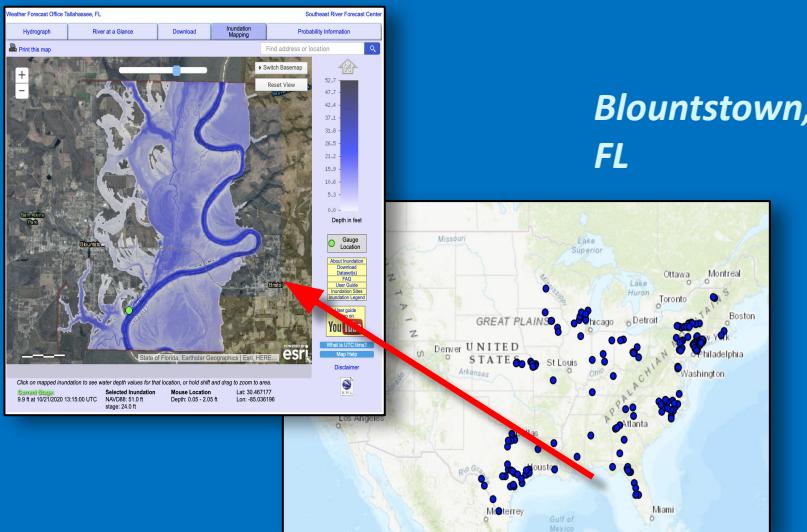
Another system will move across the region days 2 - 3 (Thu - Fri) bringing an additional 1.0 - 1.5" of rain (WPC). While little hydrologic impacts are expected from its passage, the system will keep soils saturated and cause more minor flooding across the same areas. Rivers and streams beginning day 6. The latest NWS Model (NWM) Medium Range Forecast (MRF) continues to indicate a potential for new and renewed rises along with bankfull and higher flows beginning day 8 (Mon) across portions of the Southeast in response to a slow-moving system that may bring 2 - 4" of rain (WPC). While confidence is increasing in the occurrence of an event, there is uncertainty in the placement of the signals. Latest GFS-forced NWM MRF data suggests that the more sensitive areas across northern MS and AL may be



Flood Inundation Mapping - Transformative Service

Current NWS Capability – Maps at Points

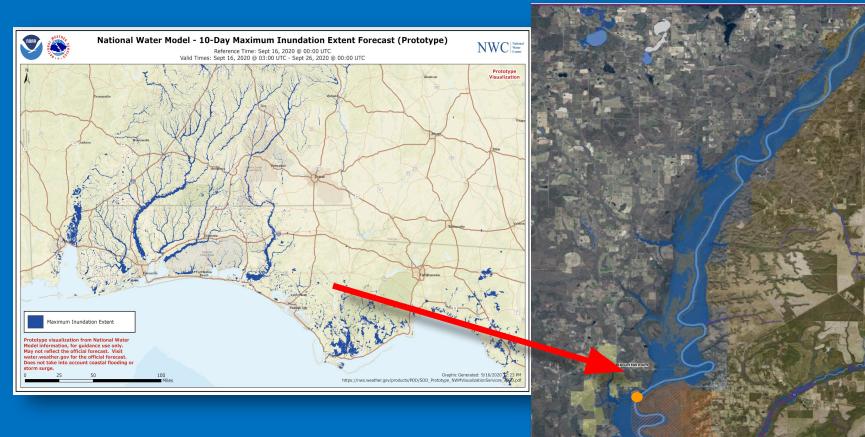
Static Inundation Map libraries at ~180 river locations across the United States.



- Limited spatial coverage, resource intensive, only at small number of USGS stream gauge locations

Next Steps - Continuum of real-time FIM

The NWM high resolution hydrography datasets allows for real-time flood inundation mapping capabilities at neighborhood-level



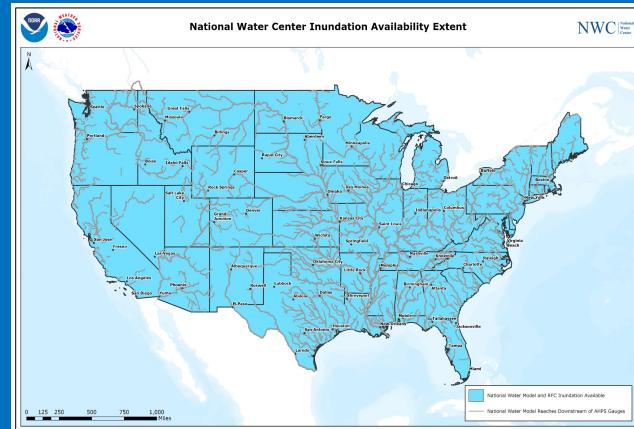
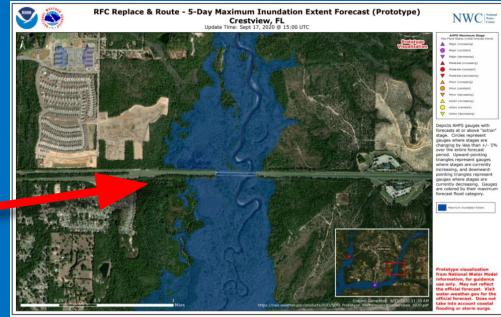
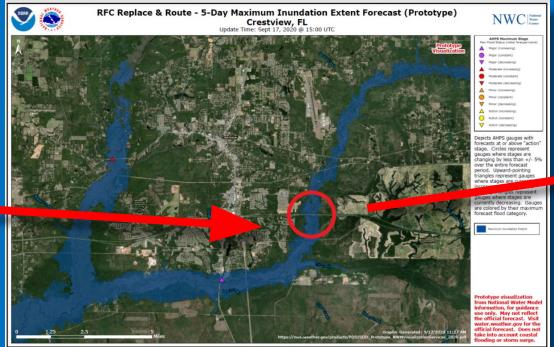
- Driven by official streamflow forecasts produced by River Forecast Centers and by NWM
- Incrementally expand flood inundation mapping to 3.5 million miles of stream reaches nationwide



Flood Inundation Mapping - FY23+

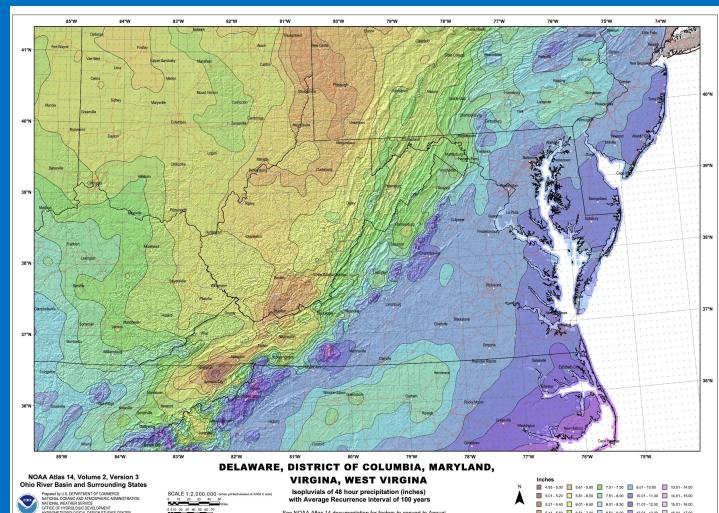
Future Services

Current Services
water.weather.gov



National Precipitation Frequency Updates

- NOAA's next generation of Precipitation Frequency estimates
 - Support from Federal Infrastructure and Investment Jobs Act FY22-26
 - Authoritative federal source for precipitation frequency information
 - Used for planning and design of all build infrastructure
- Replaces current Atlas 14 estimates of rainfall frequency for events...
 - from 5 minutes to 60 days
 - recurrence intervals of 1 to 1000 years.
 - <https://hdsc.nws.noaa.gov/hdsc/pfds/>
- To be delivered with robust web visualizations and data services.



National Precipitation Frequency Updates

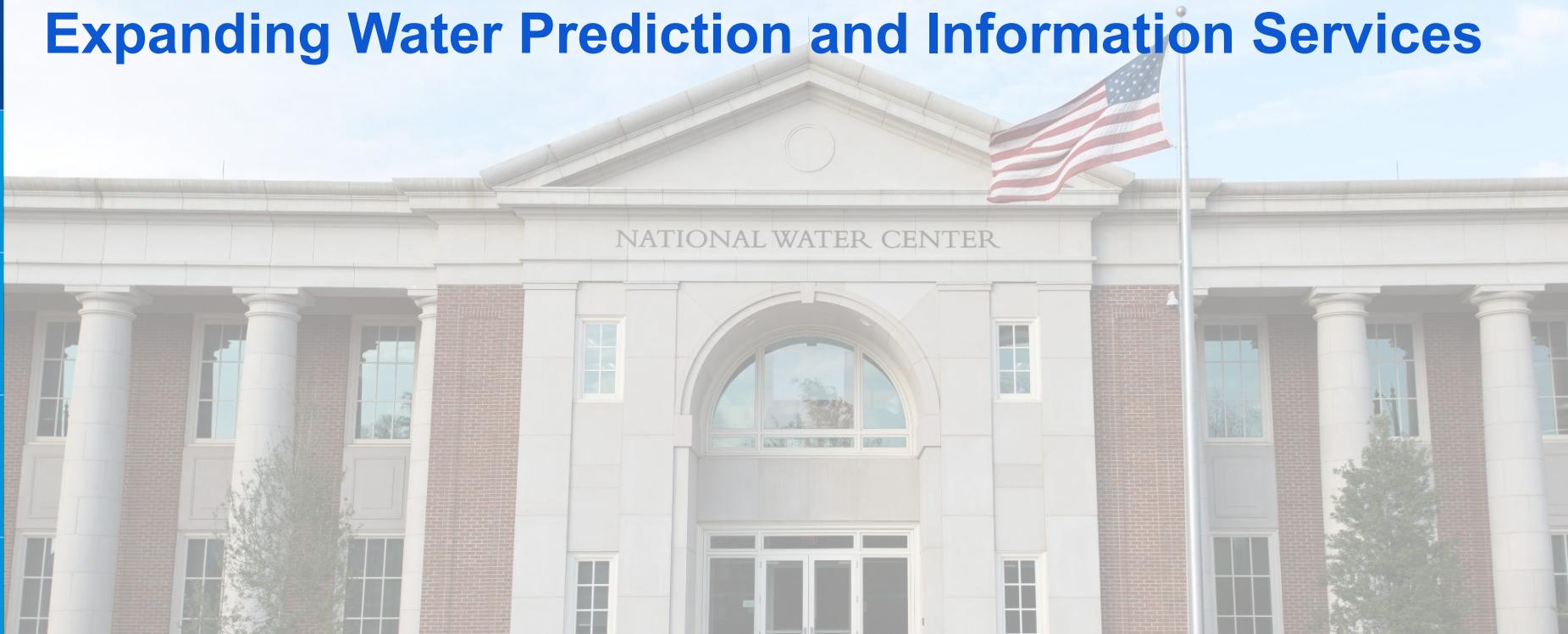
- Two volumes of precipitation frequency
 - **Volume 1: based on historical gages and observed trends**
 - *Includes modeled trend in historical observations to account for short-term non-stationary temporal changes.*
 - *Non-stationary trends represents a major enhancement from Atlas 14.*
 - **Volume 2: incorporates climate projection adjustment factors**
 - *future precipitation informed by global climate models, modeled non-stationary temporal changes*
 - *provides adjustment factors based on historical observations (Volume 1) to calculate future estimates.*

Proposed methodology described in:

“Analysis Of Impact Of Nonstationary Climate On Noaa Atlas 14 Estimates : Assessment Report”
https://hdsc.nws.noaa.gov/hdsc/files25/NA14_Assessment_report_202201v1.pdf



Expanding Water Prediction and Information Services



Thank you !
Questions ?
[<Mark.Glaudemans@noaa.gov>](mailto:Mark.Glaudemans@noaa.gov)

