

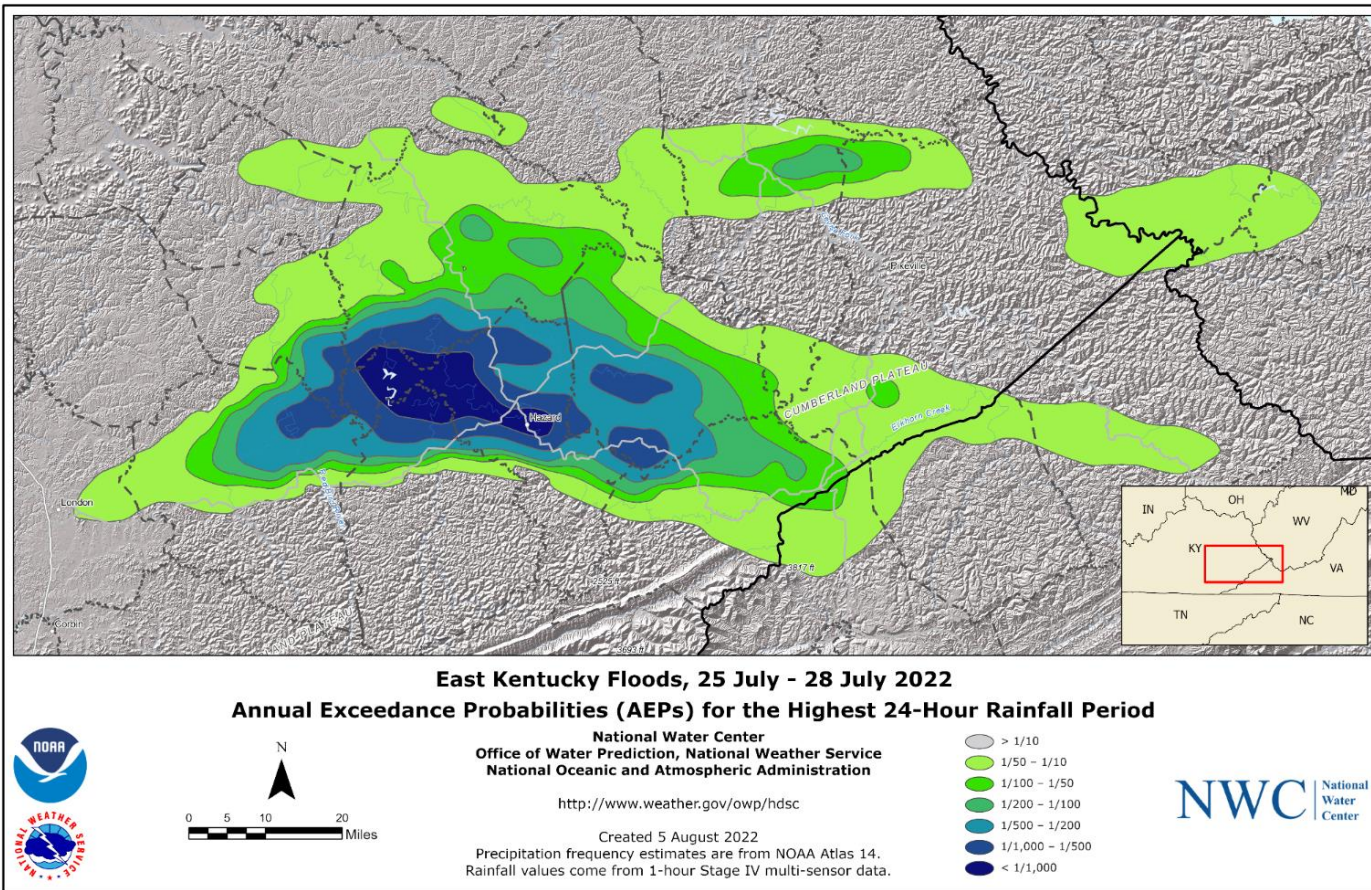
Actionable Intelligence from the National Water Center Products and National Water Model Visualization Services: Kentucky Flood Event July 2022

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Tuscaloosa, AL, USA

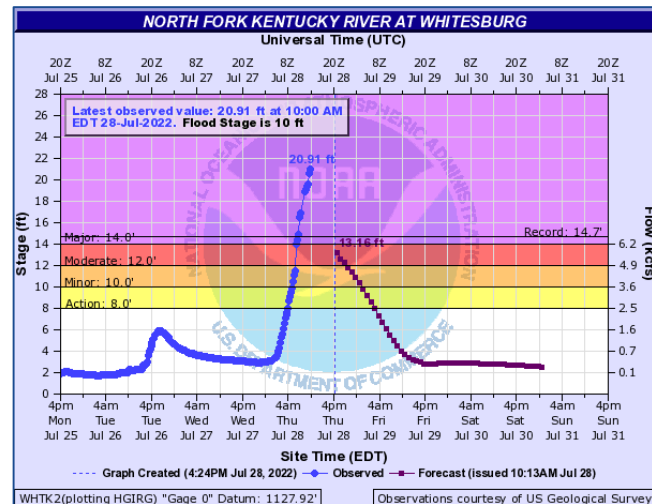
**AMS 104th Annual Meeting
Advances in Large-scale Flood
Modeling, Monitoring, Forecasting,
Analysis, and Management I
January 31, 2024**

Rainfall Totals / Annual Exceedance Probabilities



Impacts

- Catastrophic flash flooding in Eastern Kentucky from July 25-29, 2022
- Claimed the lives of 43 people
- Deadliest non-tropical flood event in the United States since the late 1970s
- Record flooding of the North Fork of the Kentucky River (Jackson and Whitesburg)



NWC Experimental Products (Publicly available)

Experimental Area Hydrologic Discussion #230

Valid Times: Wed, 27 Jul 2022 21:44:22 UTC - Thu, 28 Jul 2022 10:30:00 UTC
Issuance Date/Time: Wed, 27 Jul 2022 23:46:28 UTC

WHAT: Flash, urban, and small stream flooding
WHERE: Portions of central and eastern KY, southeast OH, WV, southwest VA
WHEN: Through early Thursday morning

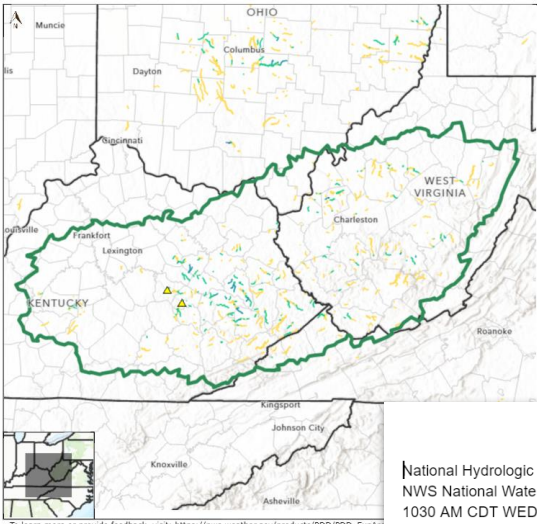
FORECAST RAINFALL AND ANTECEDENT CONDITIONS
QPF: 1 - 3" (HRRR)
QPE: 2 - 6"+ (past 2 days, NRM5)
Rainfall Rates: 1 - 2" /hr (WFO)
Soil Saturation: 55 - 75% (0 - 10 cm RSM, NASA SPART)
Streamflows: Above normal (NWM Streamflow Anomaly Analysis, USGS)

DISCUSSION:
Additional showers and thunderstorms producing 1 - 2" /hr rainfall rates are expected to develop across the area of concern through the late evening and early morning hours. Several inches of rain have already fallen across the area over the past couple days, resulting in nearly saturated soils and streamflows that are above to well above normal. Thus, little in the way of soil infiltration or in-channel storage capacity exists, and any additional heavy rainfall is likely to generate significant runoff and the potential for rapid rises along creeks and streams.

The NWM SRF is signaling scattered elevated probabilities (>50%) for rapid-onset flooding from eastern KY into WV. Flash, urban, and small stream flooding will be possible across the area of concern through the early morning hours of Thursday. The primary limiting factor for the spatial extent of potential flooding impacts will be the coverage of storms.

However, given the antecedent conditions, flooding impacts are likely in any areas where heavy rainfall rates materialize and persist. The potential for flooding impacts will also be higher in areas of steep terrain, and in low-lying or poor drainage areas.

/JMSR
ATTN: WFO...JLN...LMK...JLK...RLX...RNN...MRX
ATTN: SFC...TR...WPC



To learn more or provide feedback, visit: https://nws.weather.gov/products/PDD/PDD_Explore

NWC National Water Center

EXPERIMENTAL DISCUSSION

National Hydrologic Discussion - EXPERIMENTAL
NWS National Water Center - Tuscaloosa AL
1030 AM CDT WED JUL 27 2022

Synopsis...

Considerable flooding impacts in the [Ohio and Tennessee River Valleys and Central/Southern Appalachians](#)... Isolated flood threat will continue into next week despite drier conditions across the [Four Corners Region into the Central Rockies and Southern Plains](#)... Flooding continues across the [Mid-Mississippi Valley into the Lower Ohio Valley](#)...

Discussion...

Ohio and Tennessee River Valleys and Central/Southern Appalachians...

A stalled frontal boundary across the region will continue to be the focus for several rounds of heavy rainfall and flash, urban, and small stream flooding impacts into next week, with considerable flooding impacts likely across extreme southeast OH, eastern KY, southern WV, and potentially into extreme western VA on days 1 - 2 (Wed - Thu). Although western portions

Experimental 7-Day Flood Hazard Outlook

Includes Flash, River, and Tidal Flood Hazards

Issued: 2022-07-26 04:00 PM CDT (21:00 UTC) | Valid Through: 2022-08-02 04:00 PM CDT (21:00 UTC) | Next Issuance: 2022-07-27 04:00 PM CDT (21:00 UTC)

Flood Hazard Messages

Southwest

- Monsoon activity through this week may generate localized flash flooding impacts in arroyos, slot canyons, and urban areas in the Four Corners region. Debris flows will also be possible near recently burned areas.

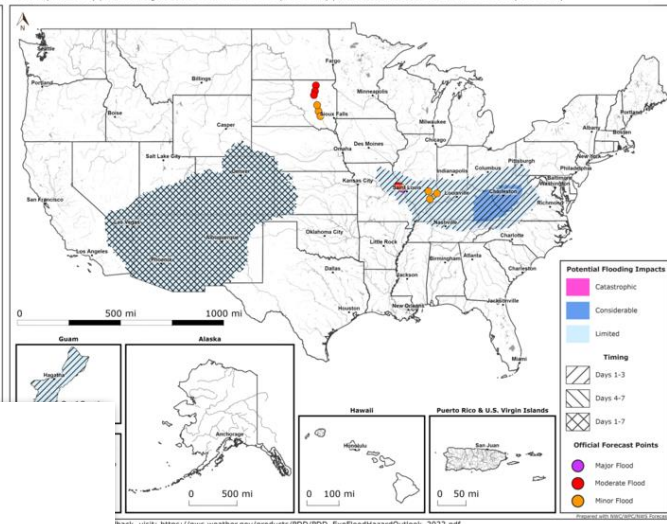
- Localized considerable flash flooding impacts may also be possible across portions of northwest Arizona through early Wednesday.

Mid Mississippi Valley and Ohio Valley to the Mid-Atlantic

- Considerable flash, urban, and small stream flooding impacts are possible through Thursday across portions of the Upper Ohio Valley and Central Appalachians.

- Limited flooding impacts are possible through Thursday across a broad area from the Mid-Mississippi Valley to the Mid-Atlantic.

- Limited flash, urban, and small stream flooding impacts are possible through Wednesday afternoon as a tropical disturbance affects the region.

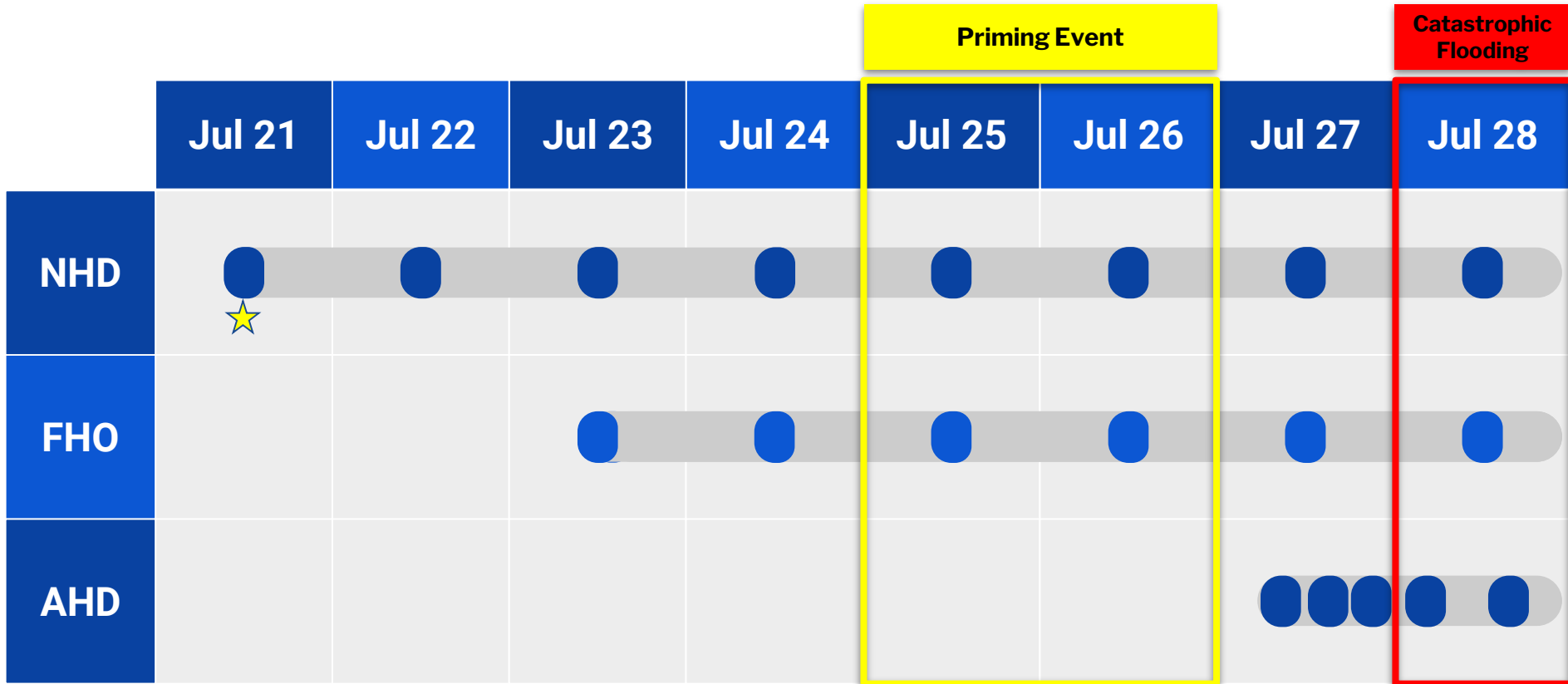


Back visit: https://nws.weather.gov/products/PDD/PDD_ExpFloodHazardOutlook_2022.pdf

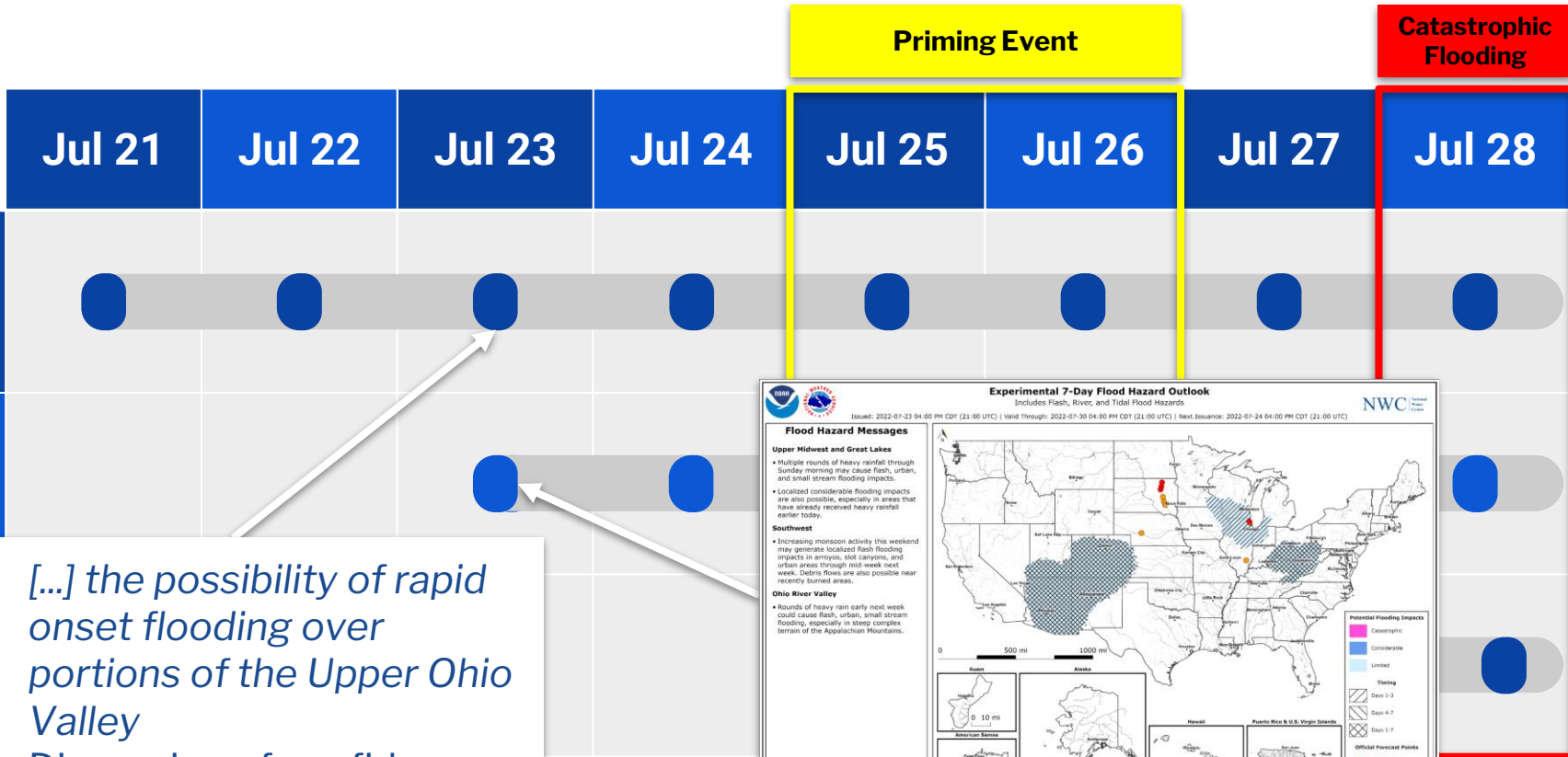
Report ID: NWS-2022-07-26

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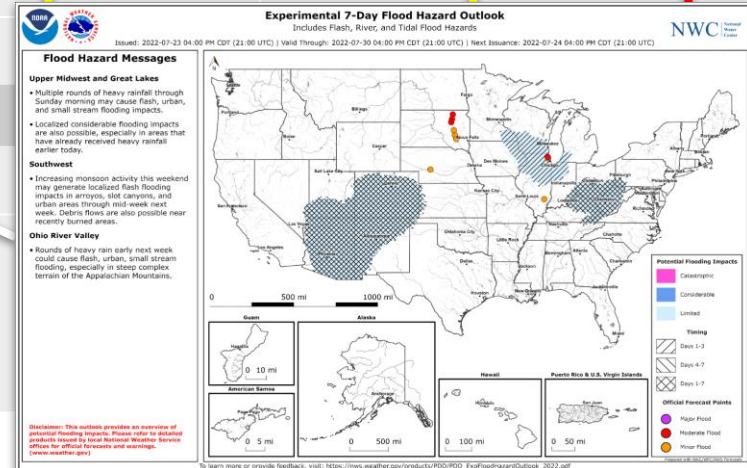
NWC Experimental Products Timeline



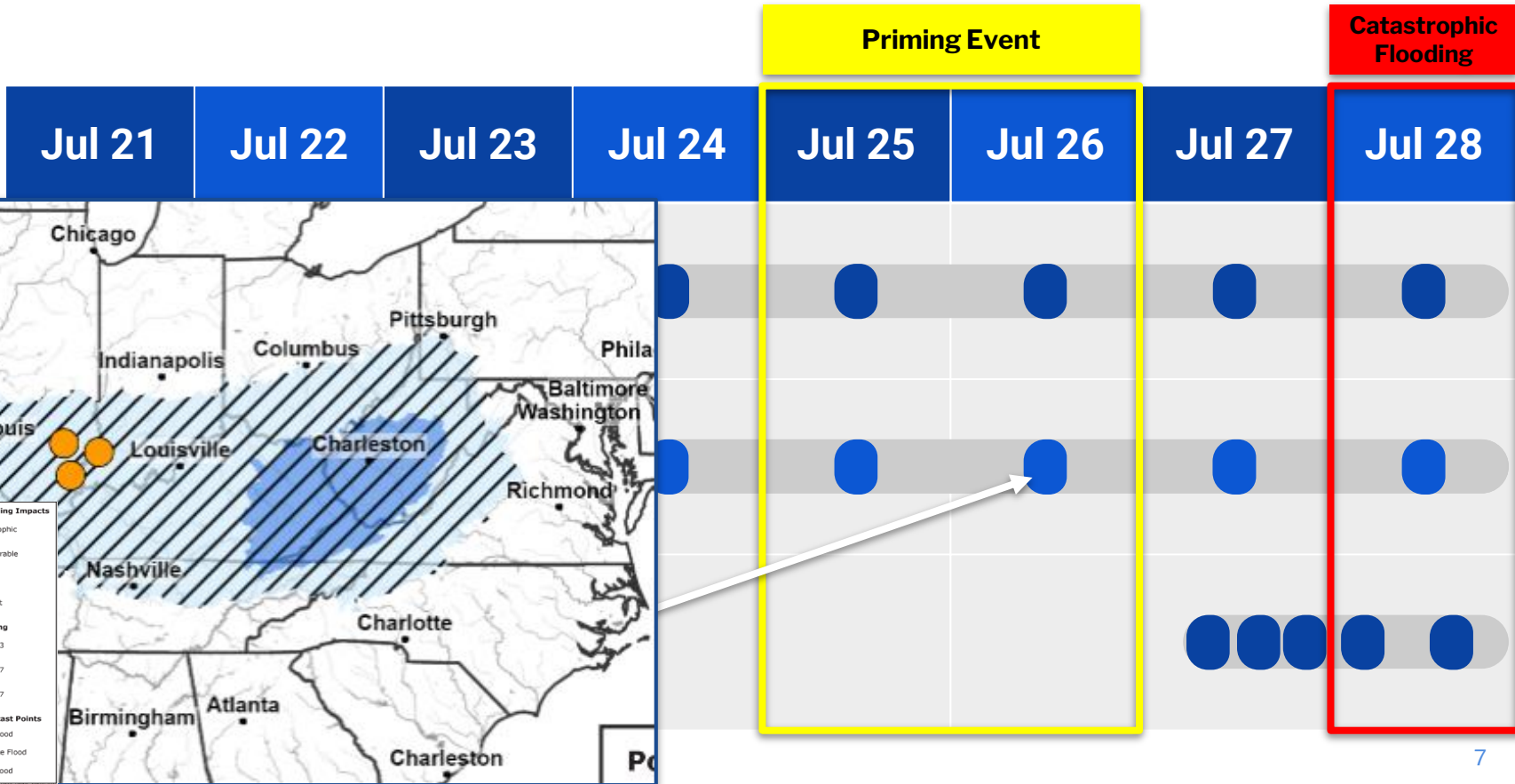
NWC Experimental Products Timeline, cont.



- [...] the possibility of rapid onset flooding over portions of the Upper Ohio Valley
- Discussion of confidence



NWC Experimental Products Timeline, cont.



NWC Experimental Products Timeline, cont.



Experimental Area Hydrologic Discussion #230

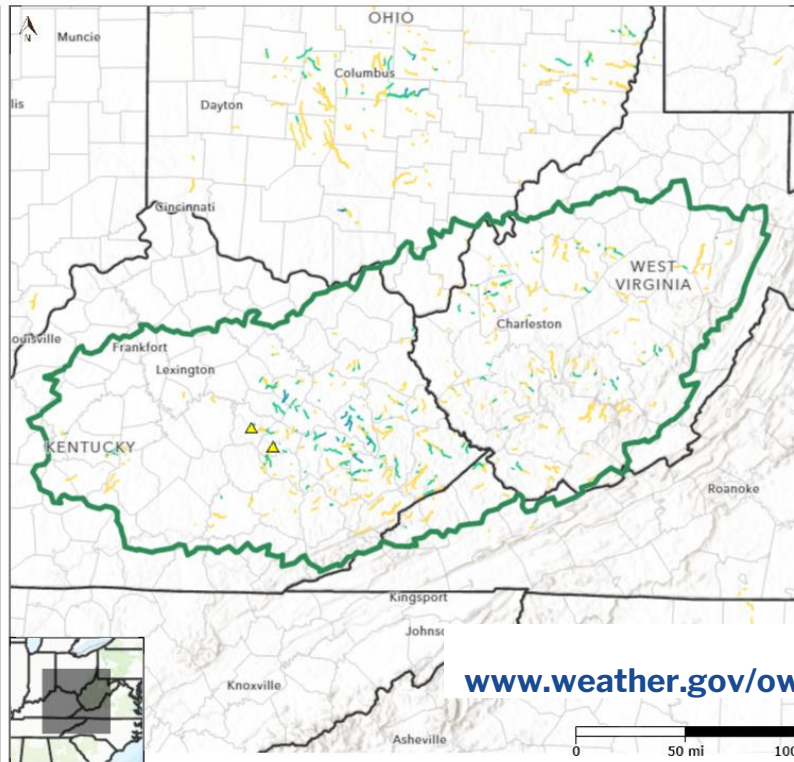
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NWC National Water Center

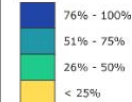
- [...] QPE: 2-6"+ over the past 2 days
- Streamflows: above normal
- [...] Several inches of rain have already fallen, saturating soils and elevating streams to above normal [...] little soils infiltration or in channel storage capacity exists...
- [...] elevated Rapid Onset Flooding probability signals...

stream flooding
eastern KY,
A
/ morning
ECCEDENT
MS)
10 cm RSM,
WM Streamflow
storms
is are expected
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/limiting factor
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storms:
conditions,
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and persist. The
ill also be higher
low-lying or
RLX...RNK...MRX



Area of Concern
Other Active AHDs

Hours 1-12 Rapid Onset
Flooding Probability (%)



RFC Maximum Stage

Maximum Flood Status



Forecast Trend



www.weather.gov/owp/operations

Disclaimer: The National Water Model (NWM) Short Range Forecast (SRF) is forced by the HRRR.

To learn more or provide feedback, visit: https://nws.weather.gov/products/PDD/PDD_ExpAreaHydrologicDiscussion_2022.pdf

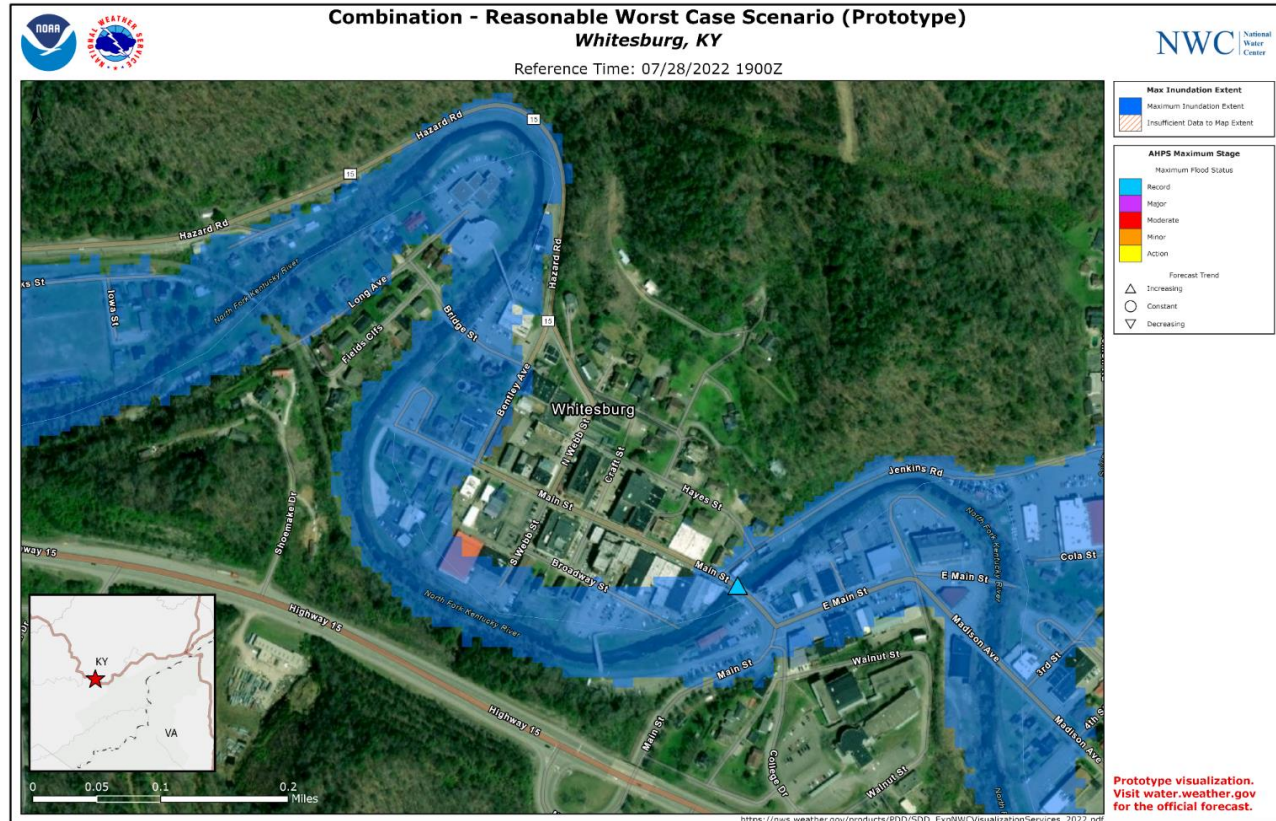


FEMA Support - NWS Flood Inundation Mapping

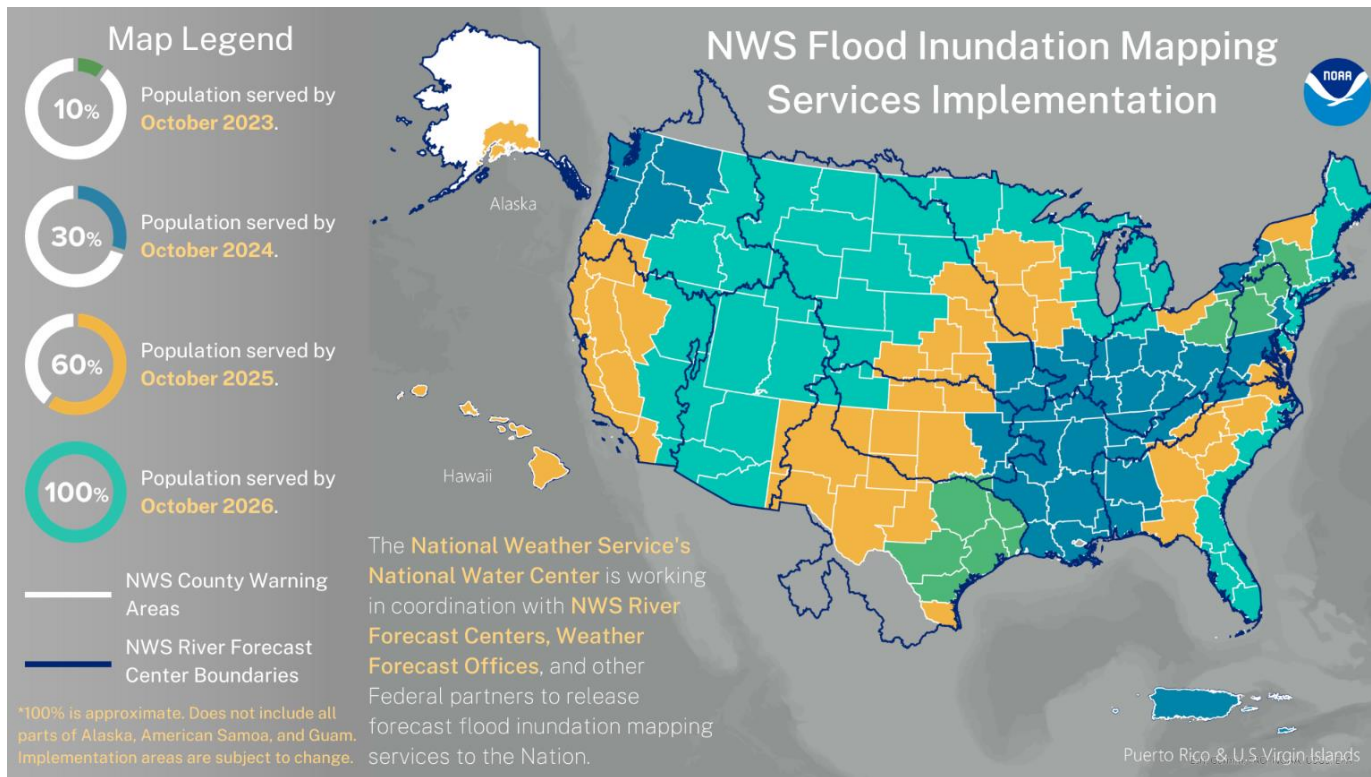
Morning of 28 July, NWC responded to FEMA HQ request quickly and provided the prototype NWS Flood Inundation Mapping to FEMA HQ

- Only available FIM to FEMA HQ at the time at this location.

Informed search and rescue operations



NWS Flood Inundation Mapping Services Implementation Plan



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

Summary

- Unprecedented rainfall event with significant loss of life and catastrophic structural damage
- NWC communicated the potential significance of this event through experimental products (NHD, FHO, and AHD) days ahead.
 - First showed up in NWC products 7 days before the event, and continued the highlight through day of event.
- NWS FIM was the only FIM that FEMA had at the time at Whitesburg, KY, and was used in the immediate search and rescue operations, recovery planning, distribution of emergency personnel and resources, etc
 - **NWS FIM will be available in the near future to help the public and emergency managers prepare for flooding impacts**



OWP | OFFICE OF
WATER
PREDICTION



Thank You!



Joe Cebulko



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<https://water.noaa.gov>
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