

# National Weather Service Flood Operations: River Flooding & Flash Flooding

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Alaina MacFarlane, Senior Hydrologist (MARFC)

Craig Evanego, Senior Service Hydrologist (WFO State College)

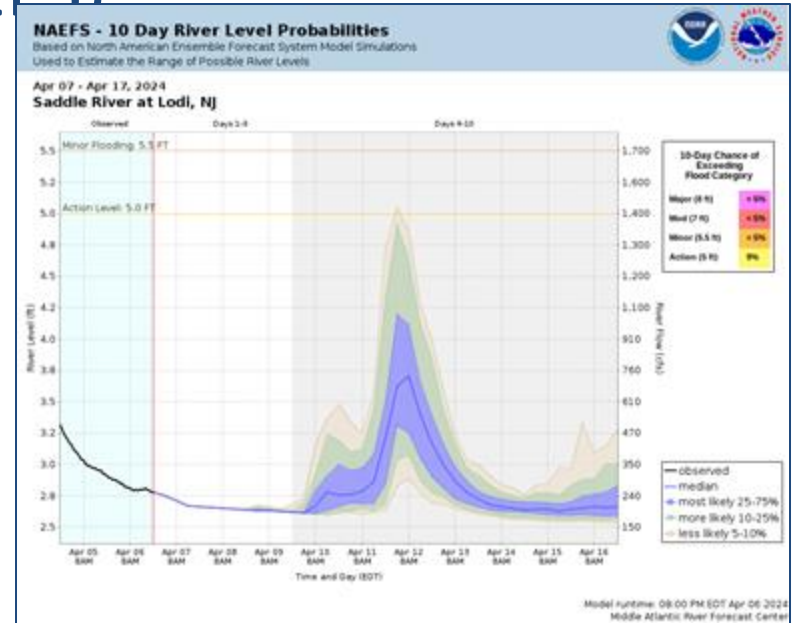
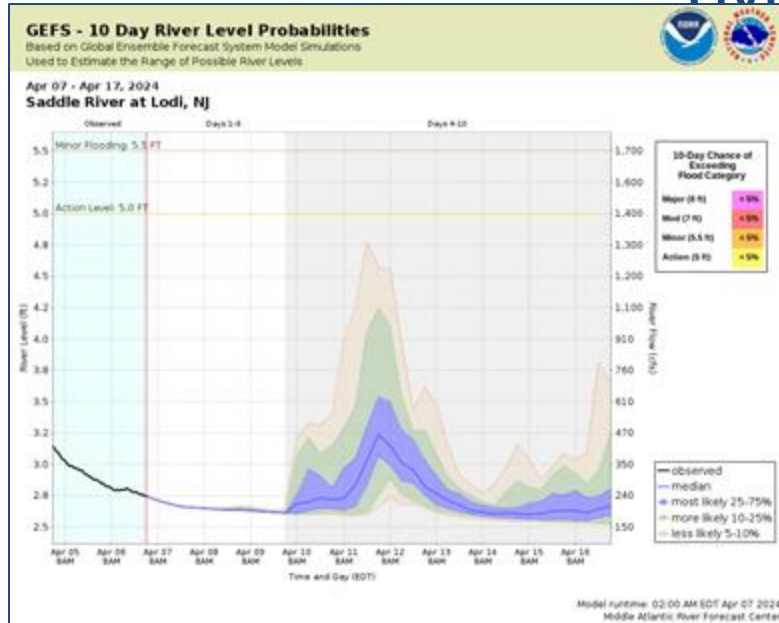


Penn State Harrisburg Workshop 2025  
Flood Risk in the Mid-Atlantic

# Flood Operations

5-7 Days before the flood

# Multi-Model Ensemble Forecasts System (MMEFS)



- Uses raw ensemble precip & temp data from NAEFS and GEFS
- Each model runs twice a day (<https://www.weather.gov/erh/mmefs>)

# Flood Operations

4-5 days before the flood

# 4-5 days before the event

- Deterministic model runs include the event
  - Days 1-3 are RFC QPF
  - Days 4-5 are Weather Prediction Center's (WPC) QPF
  - Coordinate forecasts with WFOs and COE
- Potentially issue a 1 page briefing
- Participate in partner conference calls (state EMs, federal partners and WFOs)
- Potentially issue a Significant Flood Outlook Product



Heavy Rain, River Flooding Potential in the Mid-Atlantic from Ida

Middle Atlantic River Forecast Center

**OVERVIEW: Heavy Rain from Hurricane Ida is expected to spread into the region Wednesday. Minor to Moderate river flooding is possible across the Mid-Atlantic.**

<b>Affected Rivers</b>	Heavy rain is expected Wed and Wed night across the Susquehanna, Delaware and Potomac basins, as well as the Passaic and Raritan basins in New Jersey.
<b>Timing</b>	Heavy rain arrives Wed in the Susquehanna and Potomac basins, spreading east into the Delaware, Passaic and Raritan basins by Wed night. Rain ending Thursday. River flooding would be occurring late Wednesday into Friday.
<b>Hazards &amp; Impacts</b>	Widespread rainfall of 2-4 inches is likely with localized amounts of 5-6+ inches. Minor to moderate river flooding is possible, particularly along smaller streams. Coastal, small stream, and urban flooding is also likely.
<b>Confidence</b>	There is moderate to high confidence for heavy rainfall, but the exact placement of the heaviest rain is less certain. As such, confidence is lower regarding the potential for river flooding and where that might occur.
<b>Additional Information</b>	All river forecasts are updated before noon daily with additional updates issued as needed, particularly when flooding is occurring or in the forecast. The timing of the storm is still beyond our 3-day river forecast but longer term ensembles are indicating a strong potential for flooding across the region.

Forecast Precipitation

Issued: August 29, 2021 - 11:00 am

www.weather.gov/marfc

# Briefing Example

Highlight the potential for heavy rainfall and the uncertainty.

# Flood Operations

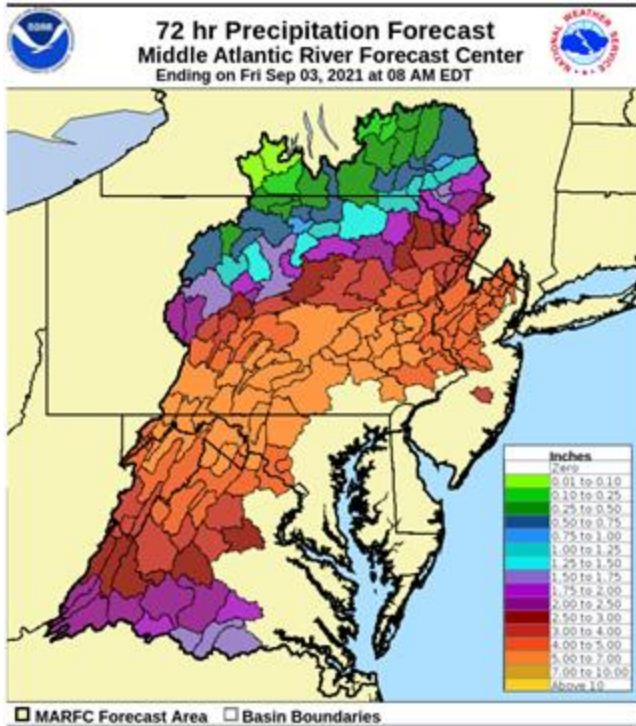
2-3 days before the flood

# 2-3 days before the event

- Coordinate precipitation forecast with neighboring RFCs, WPC and WFOs
- Deterministic hydrologic forecasts include the precipitation for the event
- Coordinate river forecasts w/ WFOs
- Coordinate reservoir releases w/ COE
- Participate in partner conference calls
- Issue briefing (potentially update to full packet)

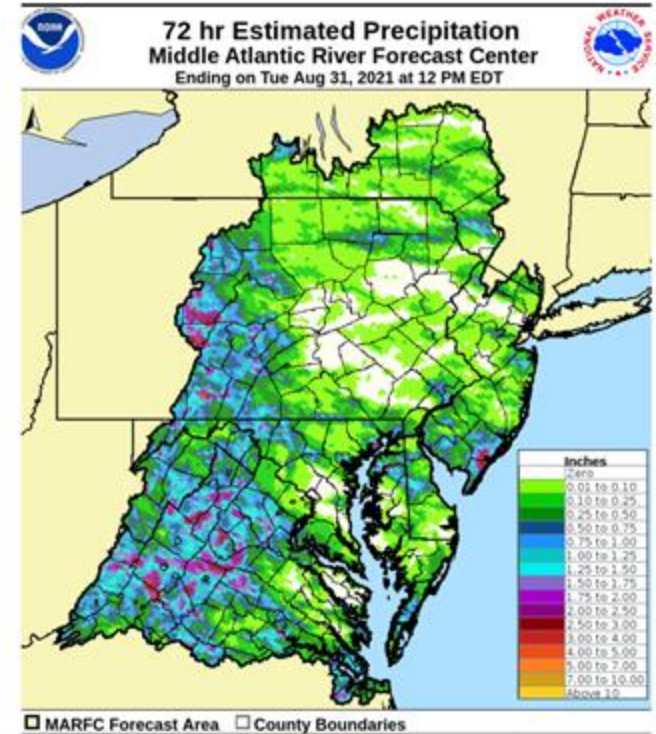


# Observed and Forecast Precipitation



Create a 72 hour precipitation forecast

Quality control  
24 hours of  
observed  
precipitation



# Flood Operations

Day of the Event

# During the event

- **Begin 24 hour operations**
  - HAS forecaster on every shift until the precipitation ends (QPF + quality control observed precip)
  - At least 1 hydrologist per shift
- **Dedicated flood coordinator**
  - Update briefing packet, participate in conference calls, respond to media requests



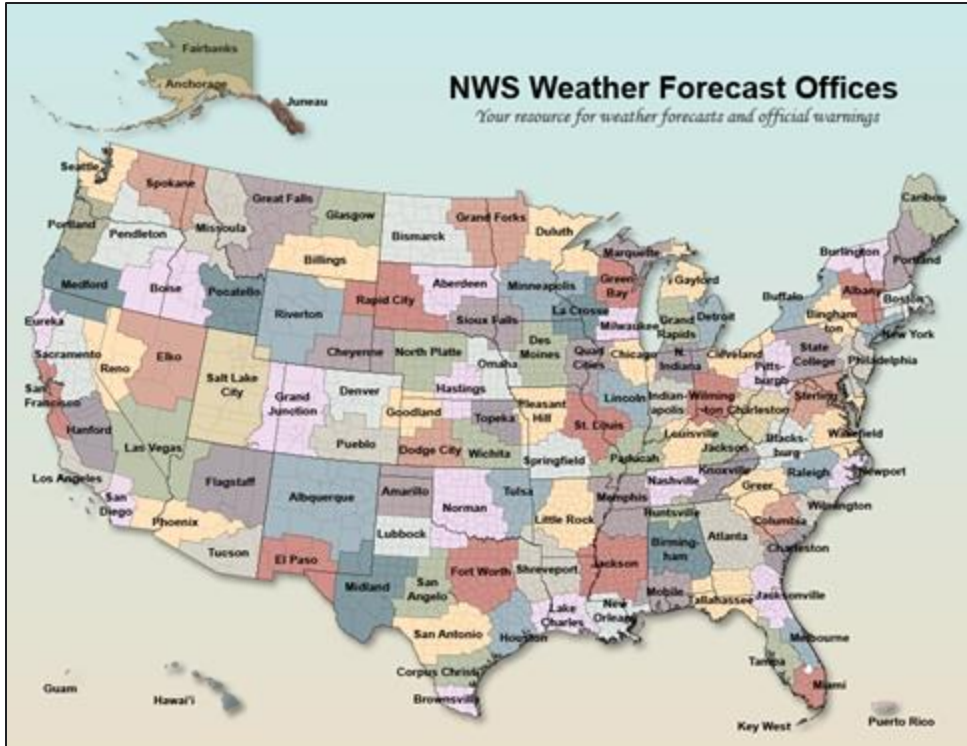
# Post Event

- Internal Review
  - What went well? What can we improve?
  - Modeling challenges?
- Larger events will have an independent service assessments



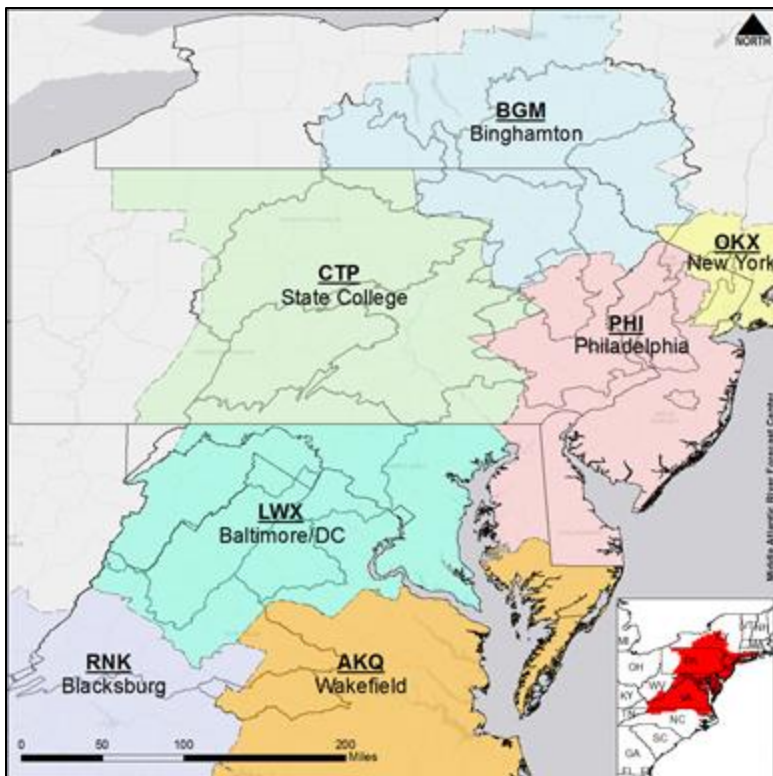
Flash Flooding  
&  
WFO Flash Flood Operations

# NWS Weather Forecast Offices (WFOs)



**122** Weather Forecast Offices nationwide

# NWS WFOs - Mid-Atlantic Region



- CTP - State College, PA.
- PHI - Phila. (Mt Holly, NJ.)
- BGM - Binghamton, NY
- OKX - New York City
- LWX - Balt/Wash (Sterling, VA.)
- RNK - Blacksburg, VA.
- AKQ - Wakefield, VA.

# What is Flash Flooding?

## **Flash Flooding**

- Life-threatening
- Occurs very quickly
- Caused by:
  - heavy rainfall over a short period of time
  - ice jam
  - dam break
- People advised to leave/avoid flood prone areas immediately



# Flash Flood Operations

Ahead of the Event

# Understanding WPC Excessive Rainfall Risk Categories

**No Area/Label**

Flash floods are generally not expected.

[www.wpc.ncep.noaa.gov](http://www.wpc.ncep.noaa.gov)  
@NWSWPC

**MARGINAL  
(MRGL)**

**Isolated flash floods possible**

Localized and primarily affecting places that can experience rapid runoff with heavy rainfall.

**SLIGHT  
(SLGT)**

**Scattered flash floods possible**

Mainly localized. Most vulnerable are urban areas, roads, small streams and washes. Isolated significant flash floods possible.

**MODERATE  
(MDT)**

**Numerous flash floods likely**

Numerous flash flooding events with significant events possible. Many streams may flood, potentially affecting larger rivers.

**HIGH  
(HIGH)**

**Widespread flash floods expected**

Severe, widespread flash flooding. Areas that don't normally experience flash flooding, could. Lives and property in greater danger.

Flash flooding near me?

Flash Flooding  
NO Flash Flooding



**OVERVIEW:**

- A slow moving system will bring periods of rain, heavy at times, through the weekend.
- Generally 1-3 inches of rain expected across east-central PA, with locally higher amounts possible.
- Localized flash flooding is possible.

**TIMING & LOCATION**

- The highest threat for flash flooding is east of a line from Gettysburg to Williamsport.
- The threat for flash flooding is Marginal on Saturday (level 1/4).
- The threat for flash flooding is Slight on Sunday (level 2/4).

**HAZARDS & IMPACTS**

- Roadway ponding and closures possible
- Urban/poor drainage flooding possible
- Rapid rises and flooding possible on small streams and creeks

**NWS ALERTS**

- None at this time.

**ADDITIONAL INFO**

- Streamflows remain elevated across much of Central PA after last week's rainfall.

**POST-EVENT OUTLOOK**

- Additional, lighter rainfall possible on Monday.
- Drier, cooler weather expected for the remainder of next week.

**NEXT BRIEFING**

- By 6 AM Saturday



# Decision Support Services (DSS)

Briefings ahead of events that highlight:

- Heavy rain potential
- Timing & Location
- Expected impacts
- Potential uncertainties



# Flash Flood Operations

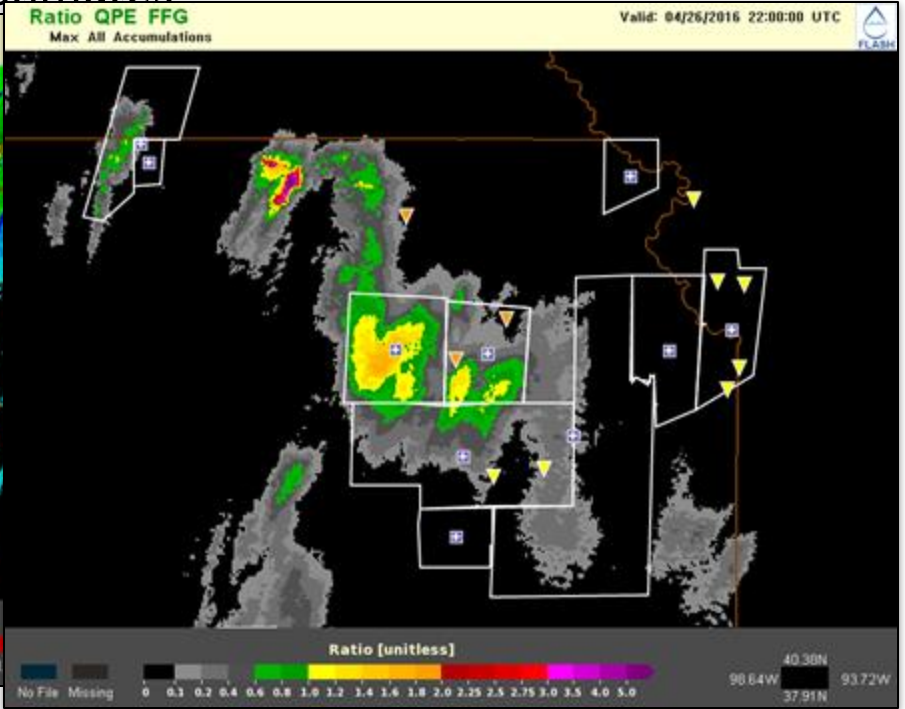
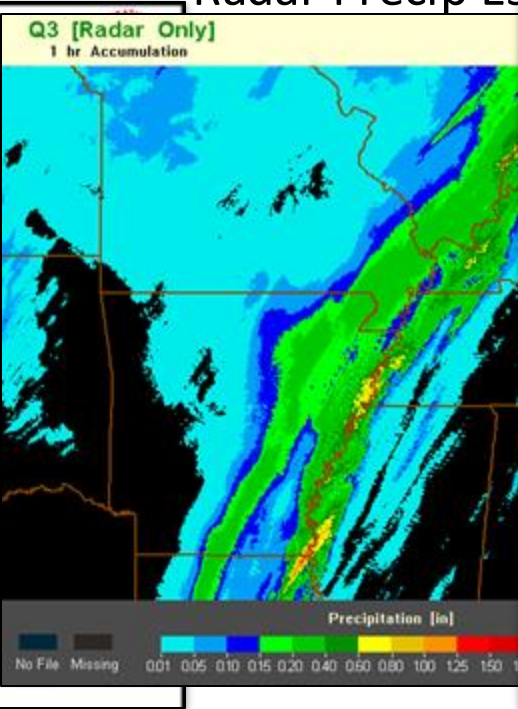
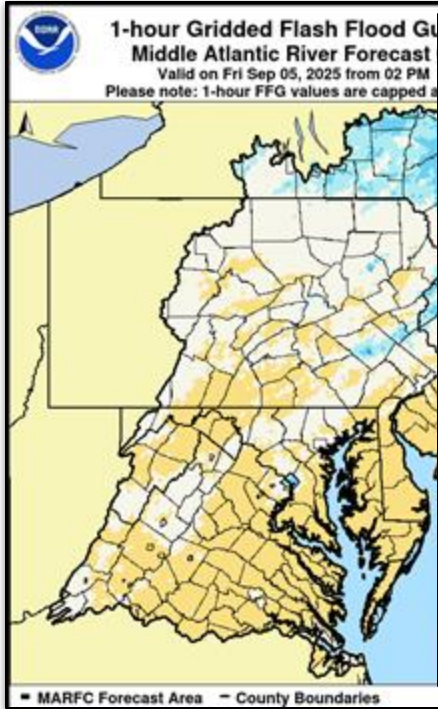
During the Event

# Tools for Interrogating Flash Flood Threat

RFC Flash Flood Guidance

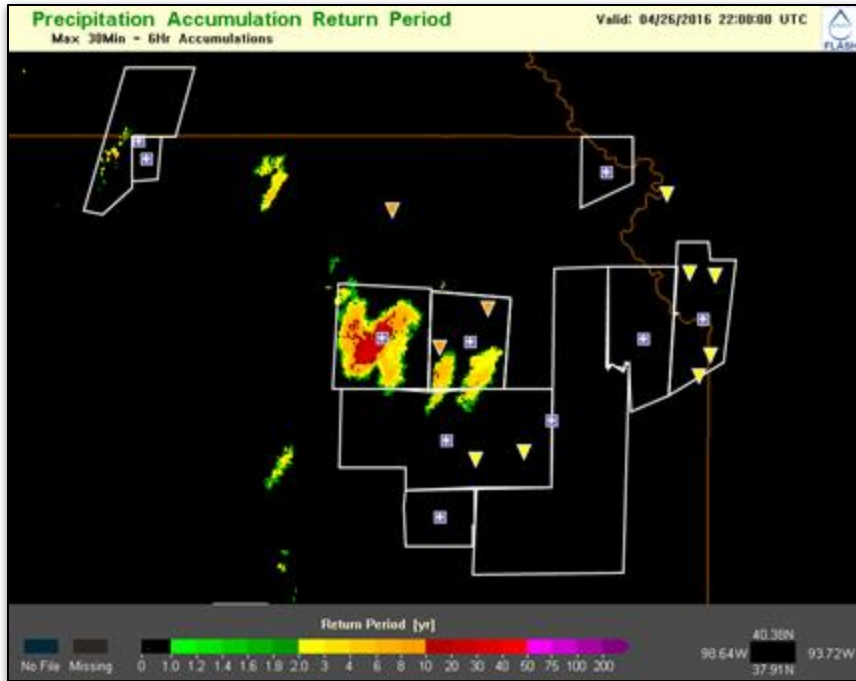
Radar Precip Estimates

QPE-to-FFG

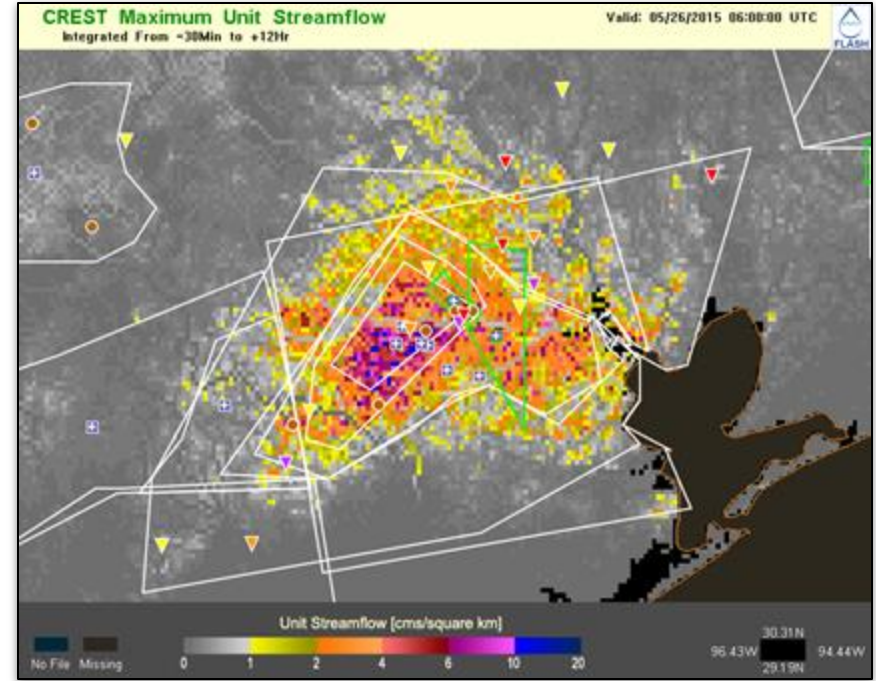


# Tools for Interrogating Flash Flood Threat

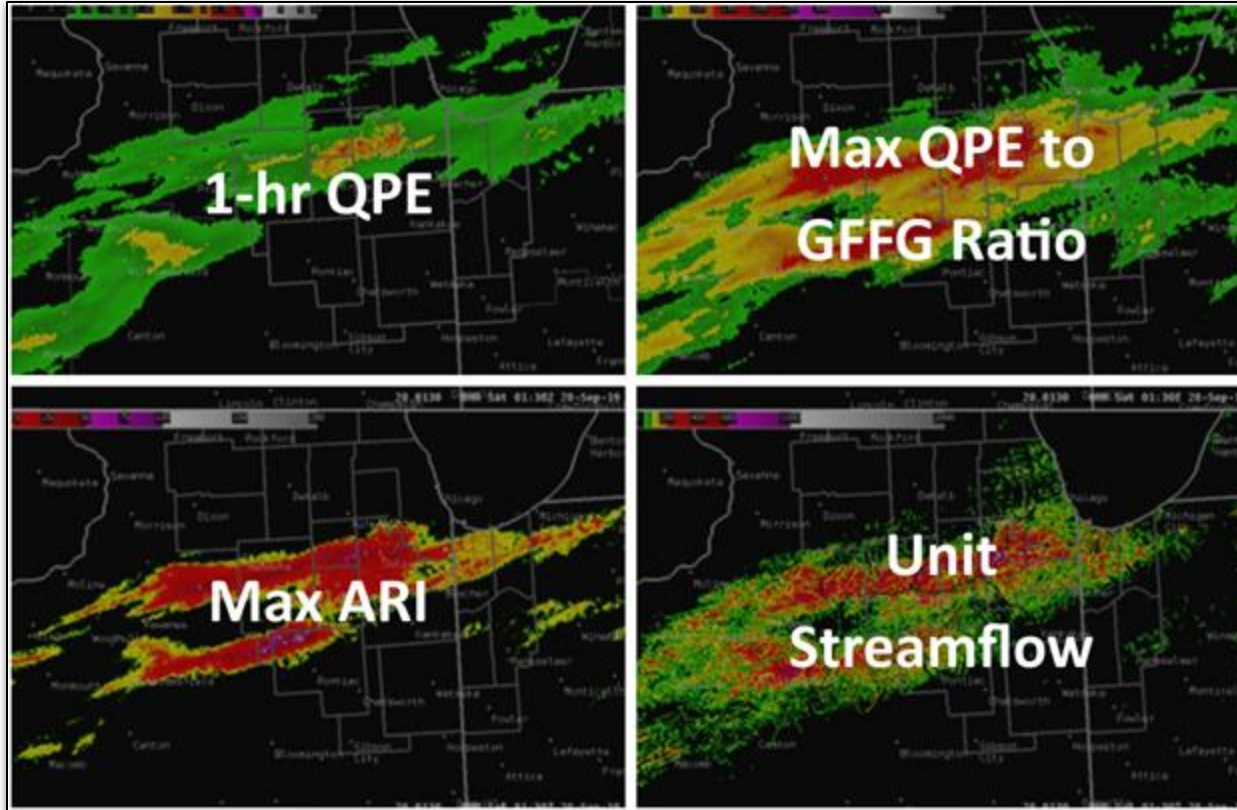
## Annual Return Interval (ARI)



## Maximum Unit Streamflow



# Tools for Interrogating Flash Flood Threat



- Not only useful for diagnosing flash flooding, but also for determining the severity of the flooding
- Flash Flooding Warnings (FFWs) come in three categories:
  - “Base”
  - “Considerable”
  - “Catastrophic”
- Considerable & Catastrophic FFWs active  
Wireless Emergency Alerts (WEA)

# NWS Dam Break Prep

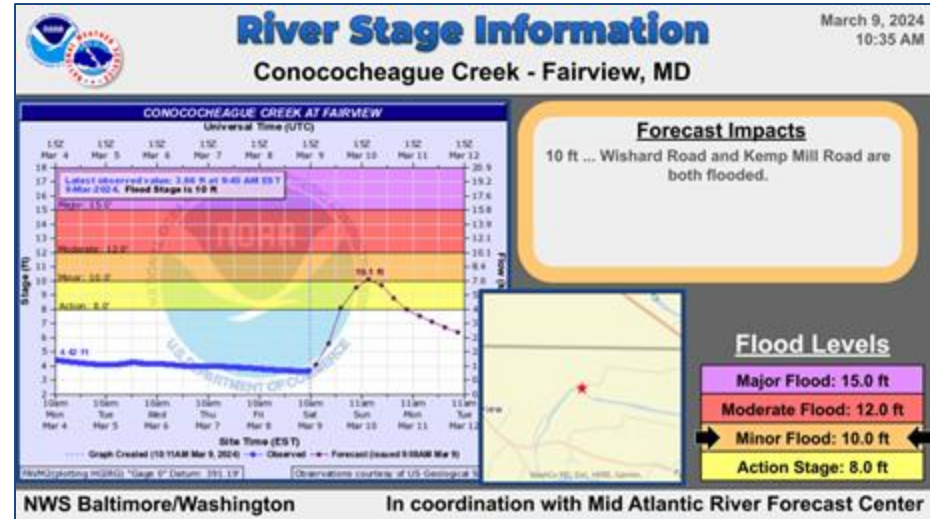
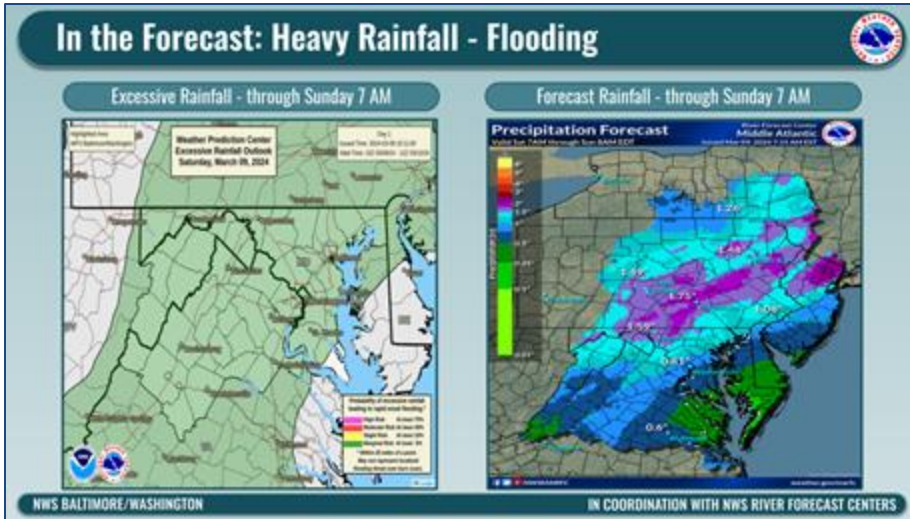
- In the event of an impending dam failure, NWS State College may issue a Flash Flood Watch or Warning for the areas downstream that may be impacted by the failure.
- Most often these situations develop rapidly and a Flash Flood Warning is issued.
  - Utilizes **WEA** for widespread dissemination
- WFO CTP has created Warning polygons for nearly 300 impactful dams across Central PA.

The screenshot displays the NWS Hazards software interface. On the left, a text panel shows a bulletin for a Flash Flood Warning issued for a dam break on the Sandy Run. The main window features a configuration panel for the warning, including fields for Type (Hydrology), Category (Flash Flood Warning), and Time Range (Start: 06:58, End: 04:00, Duration: 3 hrs). A map on the right shows a green polygon representing the warning area, labeled '902 FF W'. The interface also includes a table of hazard events at the bottom.

Event ID	ETN	Flood Severity	Time to Expiration	Lock Status	Hazard Type	Status	Stream Point ID	Start Time
900					FF/NonConvective	PENDING		00:56Z 24 Jun
902					FF/NonConvective	PENDING		00:56Z 24 Jun



# Thank you!



[alaina.macfarlane@noaa.gov](mailto:alaina.macfarlane@noaa.gov) and  
[craig.evanego@noaa.gov](mailto:craig.evanego@noaa.gov)

