Anticipating the Tropical Inland Rainfall Threat

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Weather-Ready Nation

Address the “last mile” that connects forecasts to critical decisions

The Past

Accurate, consistent forecast with decision support
America’s Go-To source for heavy precipitation and medium range forecasts to enable national readiness for hazardous weather events

National Weather Situational Awareness

Heavy Rainfall  Winter Weather  Medium Range Hazards

Actionable information that is scientific, probabilistic, & impact-based
Continuum of Heavy Rainfall Services

Day 1-3 QPF
Excessive Rainfall

Probabilistic QPF
Mesoscale Precipitation Discussion

Day 4-7 QPF

7 Days forecast lead time

Accurate, Consistent, & Understandable Forecasts with Lead Time

OUTLOOK
WATCH
WARNING
EVENT

wpc.ncep.noaa.gov

Facebook.com/NWSWPC/
@NWSWPC
7/20/2016
Seven Recent Billion Dollar Flooding Disasters

~$19 Billion in losses  134 Fatalities

South Carolina Floods  Oct 2015
Midwest Holiday Storm  Dec 2015
TX/Louisiana Flood  March 2016
Houston Flash Flood  April 2016
WV Flash Flood  July 2016
Louisiana Flood  Aug 2016
Hurricane Matthew  Oct 2016

Observed Rainfall

12 Fatalities  38 Fatalities  5 Fatalities  8 Fatalities  23 Fatalities  13 Fatalities  35 Fatalities
Source: NCEI / Storm Data

Events ARE being forecast with lead time

Proactive decision support IS motivating action

However, avoidable deaths and damages are occurring
Hurricane Matthew

Hurricane Matthew brought 10-20 inches of rain and devastating flooding to the Carolinas while tracking up the Southeast coast Columbus Day weekend.

NC MATTHEW FATALITIES
N=26

Vehicle Drowning
Other

35 Fatalities
Carolinas Flood Timeline

Oct 4 (Tue)  Oct 5 (Wed)  Oct 6 (Thu)  Oct 7 (Friday)  Oct 8 (Saturday)

Medium Range Desk Products
Highlight Threat

“Heavy Rains Expected with Hurricane Matthew as it moves up the East Coast”

WPC & ROCs establish precip collaboration strategy.

5am Day 4/5 QPF

Twice daily QPF collaboration calls

WPC briefs FEMA & partners

Change in forecast track with coastal focus.

5am Day 4/5 QPF

Increased Inland Flood Threat

WPC briefs FEMA & partners

Flash Flood Watches

5 AM Public Advisory
“Rainfall may result in flooding and flash flooding”

5 PM Public Advisory
“rainfall may result in life-threatening flooding and flash flooding”

11 am Public Advisory
...SERIOUS INLAND FLOODING EVENT UNFOLDING...

5 am Excessive Rainfall Outlook

5 am Excessive Rainfall Outlook

5 am Excessive Rainfall Outlook

5 am Excessive Rainfall Outlook

8 pm

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10/13/2016
Carolinas Flood Timeline

Oct 4 (Tue)  Oct 5 (Wed)  Oct 6 (Thu)  Oct 7 (Friday)  Oct 8 (Saturday)

Medium Range Desk Products Highlight Threat

“Heavy Rains Expected with Hurricane Matthew as it moves up the East Coast”

WPC & ROCs establish precip collaboration strategy.

5am Day 4/5 QPF  5am Day 4/5 QPF

Change in forecast track with coastal focus.

FEMA and States pre-position assets

WPC briefs FEMA & partners

Twice daily QPF collaboration calls

Increased Inland Flood Threat

Flash Flood Watches

5 AM Public Advisory
“Rainfall may result in flooding and flash flooding”

5 PM Public Advisory
“rainfall may result in life-threatening flooding and flash flooding

11 am Public Advisory...

5 am River Forecasts  5 am River Forecasts  5 am River Forecasts

5 am River Forecasts

Change in forecast track with coastal focus.

8 pm
Overall Comments – Successes

- Inland flood threat recognized early (by Tuesday, Oct 4) and ramped up on Thursday, Oct 6. Rainfall Forecasts were generally accurate from Thursday on.
- WPC had a HIGH risk of excessive rainfall issued Friday morning, that expanded westward and northward as the event neared.
- DSS was successful with FEMA. FEMA was an amplifier of the inland rainfall threat message.

Overall Comments – Challenges

- Some struggled to understand the gravity of the inland rainfall threat, given a barrage of important multi-hazard tropical information (surge and wind).
- A WPC ‘High Risk’ of excessive rainfall simply does not motivate the weather enterprise like a SPC ‘High Risk.’
- Converting rainfall threat into flooding threat
- Is there more could NWS could have done to raise the nation’s awareness of the impending inland flood disaster?
Looking Forward...
Excessive Rainfall Outlook

National summary of flash flood threat

Analogous to SPC Convective Outlook

Probability of exceeding flash flood rainfall threshold
WEATHER PREDICTION CENTER
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

**HIGH RISK** signifies a deadly and damaging day

| 1) March 11, 2016 |
| 2) April 18, 2016 |
| 3) August 13, 2016 |
| 4) August 21, 2016 |
| 5) September 1, 2016 |
| 6) October 8, 2016 |

Total fatalities in all High Risk areas:

**27**

Total direct monetary losses in all High Risk areas:

**$6.7 B**

*From NWS Storm Data, not adjusted for inflation*
Heavy Rainfall Products During Tropical Cyclones

- Challenges of tropical cyclone QPF
- Interpreting WPC QPF and Probabilistic QPF
- Other products that complete the forecaster’s message to users
- Explanation of Excessive Rainfall Outlooks

Training Coming Summer 2017 !!!
Key Points

Be Aware of the Tropical Inland Flood Threat
• Deadly aspect of landfalling tropical cyclones

NWS Products and Services Can Assist
• Excessive Rainfall Outlook
• Flood Watches
• Flood Warnings
• Training
Building a National Infrastructure

End-to-End Progress

Weather – Water

Practice, practice, practice!

Develop relationships / know partner needs

Trust

Precipitation forecasts by meteorologists

River forecasts by hydrologists

Weather Prediction Center

National Water Center

FOUNDATIONAL DATA TO DECISIONS
Deep Relationship Partner Engagement

- NOAA Leadership, FEMA HQ, and Congressional Briefings
- Collaboration Calls with the ROCs/WFOs (2x/day)

Social Media Summary

- Total Social Media Reach (Oct 1 – Oct 8): 1.86 million
- Matthew first mentioned 9/29.
- Flow of information from 10/5 - 10/8.