Communicating Probabilistic Threat Information For Severe Storms and Flooding

NATIONAL WEATHER SERVICE

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NWS Baltimore/Washington Weather Forecast Office
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Problem Statement

- **Increasing demand for severe storm & flood information several days beyond the watch phase, especially for higher impact events.**
- **However, forecasting and communicating: threat, confidence, and level of potential impact several days out is challenging.**

Agenda

- Addressing the Problem
- Partner Feedback
- Proposed Solution
- Example
- Summary

Addressing the Problem

- **Analyzed previous severe storm and flood events from the summer of 2023.**
- **Conducted multiple meetings with Emergency Managers, Transportation Planners, and Utility Companies to review past events and discuss possible solutions to better communicate threat.**
- **Gathered feedback and refined possible solutions after each meeting.**
- **With each successive meeting, worked towards an optimal solution using past events.**

Partner Feedback

“We took action only when seeing potential widespread severe event (August 7th, 2023). Mentioning isolated or scattered threats peaks interest, but does not result in actions right away.”

Bill Rees
Shenandoah Valley Electric Cooperative

“Day 3 briefings are more heads up vs taking action.”

“Bulleted info is most important part of briefing.”

“Keep consistent paradigm/presentation between weather threats.”

Eric Gentry
Director, Office of Emergency Management, Smithsonian

Partner Feedback

- **Both graphics and text are important in partner emails, because each serves different groups.**
  - Bullet point text more important for core partners.
  - Graphics are easier to inform jurisdictional leadership & the public.

- **Keep a subjective threat outlook for days 4-7, with more specific information within three days.**

- **Include a threat matrix within 3 days to assist in conveying overall confidence and potential impact for events.**
  - Matrix is connected to recommended phrases forecasters can use for conveying differing levels of confidence and potential impact.

Proposed Solution

Days 4-7 Flood and Severe Threats

1. Threat level determined by NWS Baltimore/Washington forecasters, driven by model guidance, machine learning threat analysis, and guidance from the Storm Prediction Center (SPC) and Weather Prediction Center (WPC).

2. Threat level is driven by level of confidence and potential impact matrix, but matrix is kept internal.

3. Use color scheme for threat level from NWS Graphical Hazardous Weather Outlook: green (none), yellow (limited), orange (elevated), red (significant).

Level 3 (Red) - Significant

Thunderstorms are likely, and the potential of widespread, higher impact severe weather is likely; an unusually active severe weather day only seen once every several years in this region is likely

Level 2 (Orange) - Elevated

Thunderstorms are likely, and there is potential they will become severe; confidence remains low, but widespread or impactful severe weather is possible

Level 1 (Yellow) - Limited

Thunderstorms are possible, but confidence in organized or widespread severe weather is low, OR confidence is high that the severe weather threat will remain low in magnitude

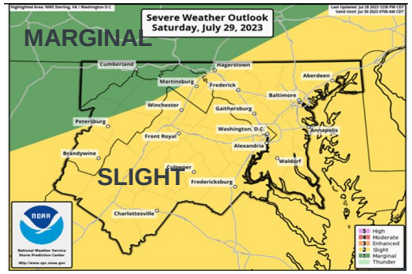
Level 0 - Little to no threat

Thunderstorms may possible, but the threat of severe weather is very low

Proposed Solution

Days 1-3 Flood and Severe Threats

1. SPC and WPC Day 1-3 outlooks are used for the threat color map graphic.



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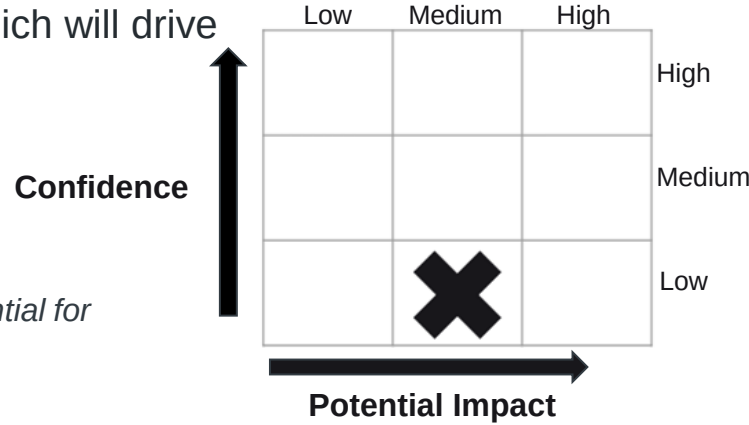
2. A threat matrix produced by NWS Baltimore/Washington integrating forecaster confidence and potential impact - which will drive differing messages.



Example Message:

* *While confidence is low at this time, there is the potential for considerable storm damage from 70 mph gusts.*

Day 4 Severe Storm Example

LOCATION: Entire area.

TIMING: Most likely during the afternoon and evening.

IMPACTS: Damaging wind gusts with potentially widespread wind damage from 70 mph winds is possible, along with large hail.

CONFIDENCE: Low

Level 3 (Red) - Significant

Thunderstorms are likely, and the potential of widespread, higher impact severe weather is likely; an unusually active severe weather day only seen once every several years in this region is likely

Level 2 (Orange) - Elevated

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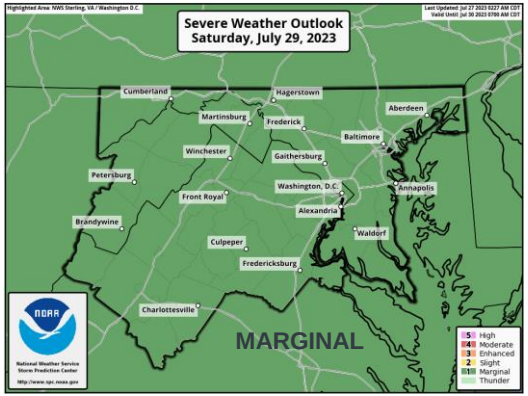
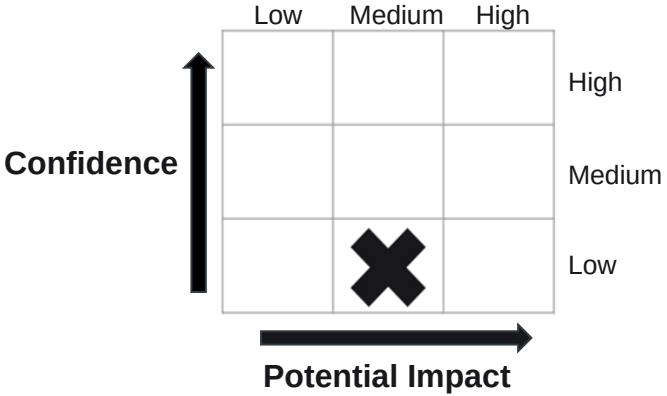
Day 3 Severe Storm Example





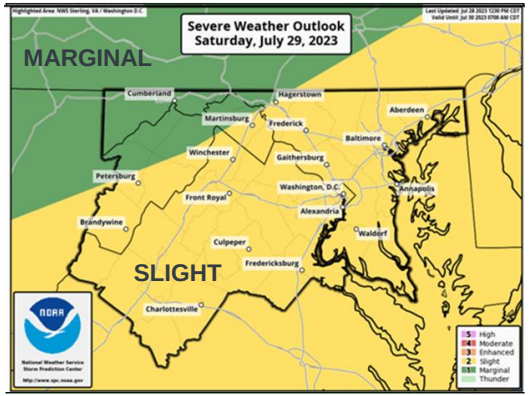
LOCATION: Entire area.

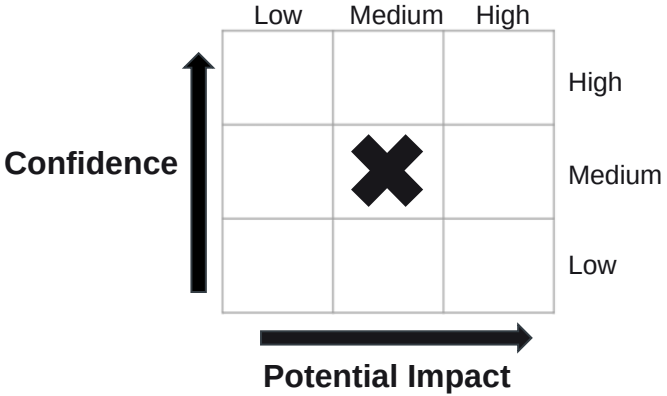
TIMING: Most likely during the afternoon and evening.

IMPACTS: Damaging wind gusts with potentially widespread wind damage from 70 mph winds is possible along with large hail.

CONFIDENCE: Low.

Day 2 Severe Storm Example





LOCATION: Entire area.

TIMING: Most likely between 2 pm and 8 pm Saturday afternoon and evening.

IMPACTS: Damaging wind gusts and large hail are the primary threats. Considerable wind damage with gusts around 70 mph are possible, especially east of the Blue Ridge and Catoctin Mountains. Power outages and blocked roads from downed trees are possible.

CONFIDENCE: Increased to medium.

Severe Storm Reports

Saturday, July 29, 2023

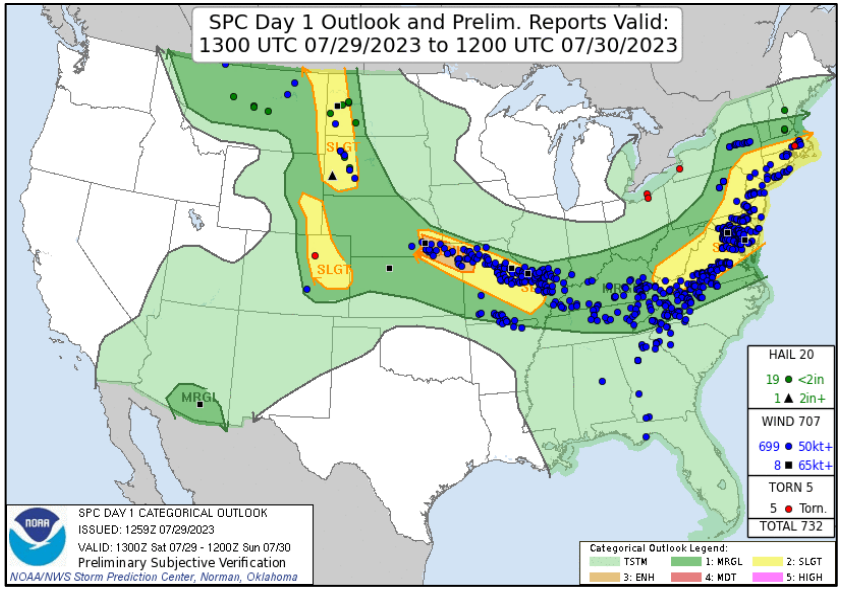
Thousands of trees down in the National Capital Region.

Hurricane-force gust (84 mph) at George Washington University.

Roof blown off apartment complex and roof damage to another business.

Numerous people were displaced after trees fell onto multiple residences.

Emergency Operations Centers opened.



Summary

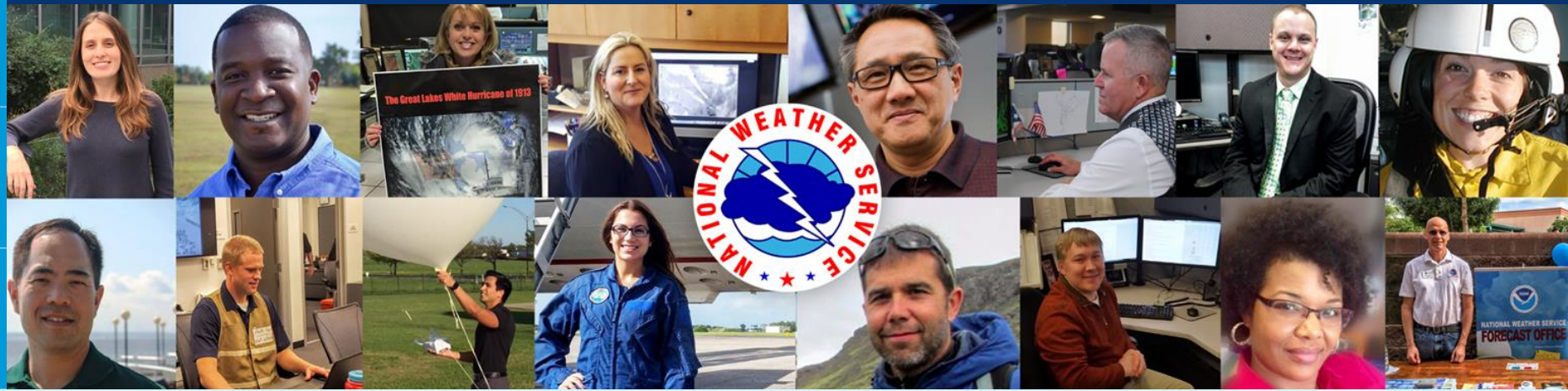
- **Increasing demand for severe and flood information for core partners beyond the watch phase.**

- **Hosted several partner meetings to refine how NWS Baltimore/Washington communicates levels of confidence & impact for severe storms and flooding.**

- **For forecast days 4-8:**
  - Developed levels of threat (using standard NWS threat colors) that will be determined by NWS forecasters using an internal matrix of confidence and potential impact.

- **For forecast days 1-3:**
  - SPC & WPC outlook graphic.
  - Threat matrix graphic that displays level of threat (confidence & potential impact).
  - Matrix value helps determine key phrases to use in communications to convey the level of threat and potential areal extent to core customers.

Thank you!


The Great Lakes White Hurricane of 1913
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Questions