

National Weather Service Weather Prediction Center Stakeholder Engagement Meeting Summary

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Executive Summary

The National Weather Service (NWS) [Weather Prediction Center](#) (WPC) invited approximately 40 internal and external stakeholders (see Appendix A) to participate in an interactive workshop on WPC products and services on June 5, 2017, at the WPC in College Park, Maryland. Stakeholders at the workshop provided feedback on how they use and interact with current WPC products and described their needs and gaps for decision-making. WPC will use this information to scope potential product and service improvements and pursue deeper engagement for future innovation.

Eastern Research Group (ERG), Inc., helped conduct the workshop as part of a broader WPC engagement-informing strategy, which has also involved discussions with WPC staff on the center's direction and evolution, an analysis of the operations workforce, and stakeholder interviews and an external survey. More than 400 people took the survey, which was hosted on the WPC homepage and distributed through WPC's social media channels.

The table below lists major themes that emerged regarding user needs over the course of the workshop and the larger stakeholder engagement effort, as well as ERG's recommendations for each.

Theme	Stakeholder Needs	ERG Recommendations for WPC
Organizational clarity and audience definition	Stakeholders want WPC to clarify how it will meet its mission for its diverse customer base, which currently consists of both experts and non-experts.	Make a strategic plan that outlines how WPC will meet the needs of its diverse customer base.
Improved products and website	Stakeholders desire more intuitive graphics that are easy to understand and easy to find on NWS websites. They also want to see more consistency in the look and feel of graphics across the NWS, as well as less technical language.	Work with social scientists to conduct website usability studies to improve the user interface of its products. Collaborate with communication or outreach experts to improve and incorporate more lay language descriptions of its discussion products.
Improved impact-based decision support services (IDSS)	Stakeholders want the value-added interpretation of a human forecast placing increasing demands on WPC to provide context around its data.	Establish a Warning Coordination Meteorologist position to lead enhanced IDSS efforts.
Data needs	Stakeholders want WPC to provide products in a GIS platform along with open data, and good metadata with units clearly and consistently expressed.	Leverage ongoing NWS GIS efforts to expand access to WPC GIS products, and continue expansion and improvement of WPC's GIS offerings.
Internal NWS coordination, collaboration, and communication	Stakeholders embraced a "one event, one forecast" concept and want to see more collaboration between National Centers and between the National Centers for Environmental Prediction (NCEP) and weather forecast offices (WFOs).	Establish a formal, collaborative role for the center during winter weather events possibly including issuing winter storm watches in collaboration with local WFOs. Other areas may apply, such as heavy rainfall.

More detailed information on these themes can be found in the "Findings and Recommendations" section of this report.

WPC Strategic Overview

The National Weather Service’s strategic goal is to build a Weather-Ready Nation to ensure communities are “Ready, Responsive and Resilient” to weather, water, and climate events. WPC contributes to this strategy as the go-to source for heavy precipitation and medium range forecasts to enable national readiness for hazardous weather events. In particular, WPC provides situational awareness, heavy precipitation, winter weather, and medium range hazard forecasts that are scientific, probabilistic, and impact-based (see Figure 1).

Key WPC partners can be characterized as:

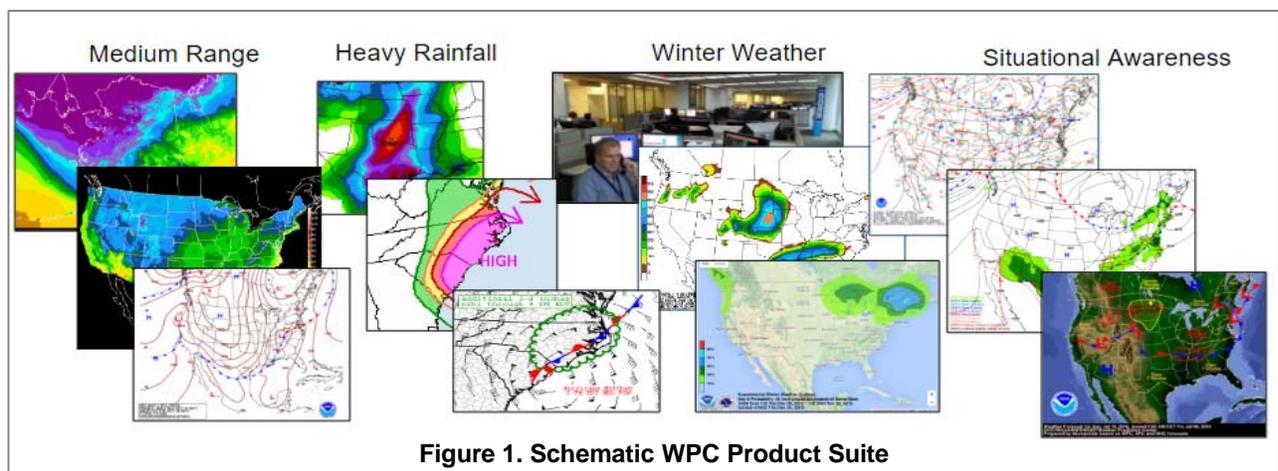
- **The public**, including the American public and weather enterprise.
- **Deep relationship partners** that depend on WPC data for critical life-saving decision-making, including NWS units—WFOs, River Forecast Centers, and NCEP—as well as the Federal Emergency Management Agency (FEMA) and the Department of Homeland Security.
- **Core partners** that depend on WPC data, including national media, NOAA, the U.S. Army Corps of Engineers, the Department of Defense, the Federal Aviation Administration (FAA), the U.S. Agency for International Development, and the U.S. research community.

WPC has evolved to lead the collaborative forecast process within the NWS, with an increased focus on using probabilistic information. At the same time, WPC recognizes it needs to evolve its large product suite to support its diverse user base. To this end, WPC is actively moving toward GIS web services. The center is currently developing an excessive rainfall outlook (ERO) on NWS GIS web services, modernizing the National Forecast Chart, and developing a prototype Winter Storm Severity Index.

With such a large product suite, WPC described the following challenges it faces in balancing the needs of diverse internal/external partners:

- Determining whether the products should be more public-facing or demonstrating “behind the scenes” expertise for the more sophisticated users.
- Determining when to automate and when to keep the human touch.
- Deciding what to streamline and what to expand.
- Determining how to use social science in the process.

Workshop participants expressed a few concerns, namely wondering how WPC will ensure that the new products will meet users’ needs. Audience members also suggested that WPC consider how products will be used early in the development process and determine upfront whether products will be public-facing.



Workshop Structure

The workshop had four dedicated sessions, which each focused on a main WPC product area: medium range, heavy rainfall, winter weather, and general situational awareness. The session goals were to gain a better understanding of stakeholder needs, determine whether any WPC products or services should be discontinued, and brainstorm how to enhance existing products.

For each session, WPC provided an overview of the products, while ERG provided a stakeholder analysis using data collected during the external WPC customer survey. Participants discussed the following products:

- **Medium range:** CONUS Medium Range Forecast, CONUS Fronts and Pressure, CONUS Temperatures and Weather, Alaska Fronts and Pressure, Alaska Temperatures and Weather, Alaska Medium Range Forecast Discussion
- **Heavy rainfall:** QPF, QPF, Significant River Flood Outlook, Excessive Rainfall Outlook, Excessive Rainfall Discussion, QPF Discussion, Mesoscale Precipitation Forecast Discussion
- **Winter weather:** Snow and Freezing Rain Probability, Low Track, Heavy Snow Discussion, Winter Weather Outlook
- **Situational awareness:** National Forecast, Surface Analysis, Short-Range Fronts and Weather, Short-Range Public Forecast Discussion, Model Diagnostic Discussion, Storm Summaries, National High and Low Temperature

Findings and Recommendations

Over the course of the workshop, the following major themes emerged regarding WPC user needs:

- A need to refine organizational clarity and audience definitions
- Product improvements to both text and graphics and increased website usability testing
- Enhancements to impact-based decision support services (IDSS)
- Expanded data services including GIS data needs
- Improved internal NWS coordination, collaboration, and communication

Each of these themes are explained in detail below.

Organizational Clarity and Audience Definition

While WPC still has an internal customer base, it is becoming more public-facing over time, especially now that its products are available online. Balancing the needs of this diverse customer base—comprising experts and non-experts, forecasters and non-forecasters—is a key challenge for the center. Participants agreed that WPC does well in understanding its core partner base, but that it falls short in its public messaging. To design effective products, WPC must therefore decide whether it wants to continue to serve both experts and non-experts.

If WPC intends to serve the public, participants stressed that its messaging must be clear to these individuals. One stakeholder noted that the center should increase its capacity for providing user-driven information rather than simply pushing data out. Furthermore, going forward, participants suggested that WPC should continue to engage stakeholders and gather input from non- forecasters.

However, others said that WPC should instead concentrate on its core content and core partners. One individual suggested that WPC consider product usage as a funneling process whereby national products serve as the “tip of the spear.” In this way, partners can use the WPC data and provide the decision-support services to those entities that will be taking the next steps to localize or customize the national data and

products to their users.

Still others questioned whether WPC should focus on decision support or whether its primary role should be to generate and distribute value-added data. In response, another stakeholder suggested that the broader role of the NWS depends upon the customer being served. Overall, participants agreed that if WPC's organizational mission is to have two core audiences (technical and non-technical), its products and services must meet the needs of both.

Improved Products and Website

Workshop participants described the need for WPC to improve its products and website, particularly their look and feel, language, and usability. They noted that all users (experts and non-experts) should be able to look at a product and know within a few seconds what the product is about. To ensure this, there needs to be continuity and a clear relationship between how the look and language of the graphics work together. Furthermore, stakeholders suggested that these graphics should be prominently displayed on the WPC website so that they are easily accessible to all users.

Look and Feel

Workshop participants continually stressed the importance of visualization consistency and noted that it would be valuable for NCEP to standardize all national graphics. They stated that it would be useful for the NWS to have a consistent web design across the entire agency with links that are clearly and consistently labeled. WPC could also consider using tabs on its website similar to the approach taken by the Storm Prediction Center (SPC).

Although stakeholders desire visual consistency, they also identified a potential downside to a similar look and feel among graphics: users may conflate the products issued by the different National Centers. For example, they may have to "look twice" to determine whether the WPC outlook is the ERO or SPC's convective outlook. Because these products have different intended uses, if users conflate the two, they may not be able to make accurate, informed decisions. The potential for misinterpretation is exacerbated by the use similar terminology (slight, moderate, and high), highlighting the interconnectedness of the visual and its accompanying language.

One way to combat this issue and improve product understanding is to reconsider how to visualize the data. Some stakeholders suggested that WPC might not need to create completely new products or change the data, but could instead provide different visualizations of the same information. Such a measure would ensure some consistency with other National Center products while eliminating the possibility of conflation.

Language

Because WPC designed many of its products pre-internet and for sophisticated users, these products often contain scientific and technical language that the public cannot understand. As a potential solution, participants suggested that WPC hyperlink its graphics to its respective forecast discussion and provide a paragraph at the top that summarizes the technical discussion in lay terms. This approach would better balance the needs of both experts and non-experts.

Participants also noted that the language used to describe probabilistic information is particularly problematic for end users. For example, what do "significant rainfall" and "quantitative precipitation" mean and how should they be interpreted? Such WPC terms could interfere with understanding and negatively impact decision-making. However, stakeholders recognize that finding terms that everyone universally understands is next to impossible.

They thus suggested that WPC retain the more technical probabilistic information for experts, but balance it by providing context for non-technical users. For example, workshop participants proposed that WPC could enhance the probabilistic language of the experimental Winter Storm Severity Index by adding historical

analog in a pop-up message that places the graphic into a context that a lay audience understands, such as “We haven’t had this kind of storm for 30 years.” Situating a storm within a historical context would help the public better gauge severity than language saying that “there is a percent chance” of something happening.

Website Usability

To meet user needs, audience members encouraged WPC to develop its future products through iterative, rapid prototyping. This process entails gathering a group of users and developers in a room to iteratively work out a product’s kinks before it is ever released. They also repeatedly emphasized the need to enhance the usability of the products on the web.

For example, although they responded positively to the experimental National Forecast Chart, stakeholders would like the capability to interact with the map. Suggestions included the ability to toggle features (such as geographical borders) on and off, as well as scalable QPF thresholds. Other usability enhancements included linking the graphic to SPC outlooks (assuming it could be aligned accordingly) and depicting the National High/Low Temperature on the map as well.

Another suggestion included creating two NWS websites. For example, a weather.gov website could provide more lay information for the public, while a dss.weather.gov website could provide more detail for sophisticated users.

New Product Suggestions

Workshop participants also suggested several new products. For example, WPC currently produces separate freezing rain and snow/sleet products. The group desires a combined probability of winter precipitation graphic. Also, winter storm track graphics, perhaps similar to the cone of uncertainty produced for the hurricane track, were also discussed.

Stakeholders also commented that having a probabilistic product indicating a severe snow event coming one to three days out could be useful for presidential declarations, especially for ice (WPC’s Winter Storm Severity Index will incorporate ice). Another stakeholder stated he needs consolidated storm total information forecasted over the course of three days—and for these data to not be probabilistic. He reflected that he does not need a product, but rather a robust data service. To this end, he suggested that the WPC pair its database for the past and present with ensemble information so that people can use these data. This discussion highlighted the challenging distinction between stakeholders wanting data versus value-added information.

Improved IDSS

WPC does not have a Warning Coordination Meteorologist (WCM) and therefore lacks the usual go-to person who has established relationships with core partners for IDSS. Stakeholders therefore suggested that WPC consider establishing an advisory group of internal/external partners to provide ongoing discussion and support for user needs. Others suggested that WPC could balance the needs of its diverse customer base by creating an IDSS position or a WCM position. This person would lead the Center’s IDSS and enhance relationships with partners.

A key need is conveying the “so what” factor behind technical product information. For example, WPC issues QPFs that may say that 5 inches of rain will fall, but the visual alone does not convey why this information is important to users or why they should care (i.e., the “so what” factor). This points to the need for a focal point/WCM position at WPC. This person would be able to combine forecast information with other environmental factors that provide the impact of a forecast and then communicate this information in laymen terms either through WPC products or through decision support webinars.

For example, the ERO highlights the importance of improved IDSS in WPC products. External partners are increasingly placing demands on WPC to provide context around its data. Unlike QPF forecasts, which

provide the amount of potential rainfall, the ERO looks at the amount of rain and rainfall rates to identify areas at risk of flash flooding. By synthesizing this information, the ERO combines data with context and impact, thereby addressing the “so what” factor. It provides value-added impact information that people can use to make decisions. In this way, the ERO epitomizes the difference between providing information versus just data.

Participants further noted that for flooding and water-related concerns, the National Water Center will provide national IDSS through a collaborative approach with the other National Centers, including WPC. However, no such role for IDSS exists at the national level for winter products, and stakeholders expressed a desire to see it.

The group agreed that an IDSS position is also important for communicating probabilistic information to non-technical stakeholders who do not know how the probabilistic products verify or how to take away specificity from the data. For example, stakeholders value knowing the human forecaster’s confidence in a forecast, which data cannot intuitively convey. Another stakeholder provided an example of using WPC’s QPF to guide planning activities, such as for reservoirs. Stakeholders added that they would like to see more specificity and verification of the medium range QPF forecasts. Others commented on how the presentation of the Day 6 and 7 QPF conveys a level of precision that does not exist. Therefore, having a role for IDSS that allows WPC to emphasize forecast confidence and depict uncertainty differences between the short and medium range is critically important.

Data Needs

With WPC’s organizational mission having two core audiences (technical and non-technical), its products and services must meet the needs of both. While non-technical audiences are driving a need for improved graphics and a formal role of IDSS, WPC’s technical users are driving the need for improved data services and access. Many of WPC’s technical users, especially those from the private weather industry, design their own graphics, and thus, require the raw data behind any of WPC’s products.

Both technical and non-technical participants, however, repeatedly emphasized the need for data with a particular emphasis on GIS formats. They encouraged WPC to push out its data in a consistent, intuitive way and in formats they can use. For example, users want to easily find GIS files on the website for every product. Further, they suggested hosting the data in similar locations on all national center websites. They also asked that WPC make raw data available and provide detailed metadata for the different products.

Internal NWS Coordination, Collaboration, and Communication

Beyond the mission of WPC alone, the group also considered why the NWS is not consistent as a whole and why the National Centers are each a little different. For example, they questioned WPC’s role versus the WFO’s role. Stakeholders noted that at the local level, a WFO issues watches, warnings, and advisories based on criteria, and that WPC offers a needed national perspective on the forecast. Given that the National Hurricane Center and SPC issue watches for their hazard domains, the group pondered why winter weather watches do not originate from WPC.

Having WPC issue watches would bring consistency, which is desired by stakeholders, but WPC is unsure if this is possible given its present resources. Another stakeholder pointed out that having WPC issue watches complements how the NWS is evolving. Issuing watches would position the WPC as a center of excellence for winter weather while ensuring collaboration with the WFOs. Most importantly, stakeholders emphasized the “one event, one forecast” philosophy does not currently exist for winter weather forecasts. Stakeholders believe that creating a formal, collaborative role for WPC during winter weather events will provide this desired consistency.

Conclusion and Recommendations

The day-long engagement workshop provided an opportunity for WPC and its internal and external

stakeholders to reflect on WPC's roles and responsibilities, customer base, and products and services. While the group acknowledged that WPC serves a broad customer base, many participants urged the center to focus on its core partners and their needs—and not try to be everything to everyone. The challenge, which stakeholders recognized, is that the needs for technical and non-technical core partners are distinct. From the workshop findings, as well as from ERG's larger WPC stakeholder engagement effort, ERG offers the following recommendations to address each stakeholder need:

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Although the workshop collected many constructive comments to help WPC improve its products and services, workshop participants emphasized the value of WPC's information to their respective positions and organizations. Participants stressed that current WPC products largely meet their needs. As a result, their comments focused largely on more overarching, across-product suggestions and desires. WPC aims to provide actionable information that is scientific, probabilistic, and impact-based to ensure national readiness for hazardous weather events. Though this report offers some improvements, it is clear that WPC's stakeholders believe that WPC is meeting its mission.

Appendix A – Attendee List

Name	Affiliation
Michelle Hawkins	AFS/Severe, Fire, Public, Winter Weather Services Branch
Darin Figurskey	Ocean Prediction Center
Matthew Rosencrans	NOAA/NWS/NCEP/CPC
Andy Horvitz	NWS/Analyze, Forecast and Support Office/Public Program Lead
Mary Mullusky	NWS AFSO
Brian Cosgrove	NWS/OWP
Regis Walter	NOAA's Homeland Security Program Office
Howard Bernstein	WUSA-TV
Kevin Johnston	FAA System Operations
Dave Jones	StormCenter Communications, Inc.
Adam Carpenter	American Water Works Association
James Nelson	WPC - DTB Chief
Frank Brody	NWS/NCEP/AWC/NAM
Matthew Green	FEMA
Kathryn Gilbert	NWS WPC
Greg Carbin	NWS WPC
Dave Novak	NWS WPC
Doyle Rice	USA TODAY
Mike Bilder	NWS Office of Chief of Staff
Chris Landsea	NWS WPC
Tom Renkevans	NESDIS
Dennis Staley	Chief Operating Officer NCEP
Daniel Porter	NOAA
Martin Waysome	FEMA

Madeline Jones	New Light Technologies, INC (GIS Contractor to FEMA)
Somer Erickson	FEMA
Tony Fracasso	WPC
Robert Ryan	Consultant
Alex Liggitt	WJLA-TV
Erica Brown	Association of Metropolitan Water Agencies
Leslie Chapman-Henderson	Federal Alliance for Safe Homes (FLASH)
Dan Cobb	PMO - CFP Objective Lead
Mark Jackson	PMO - NWS Evolve
Todd Lericos	Evolve NWS - PMO
Matthew Alto	AccuWeather
Paul Pisano	Federal Highway Administration
Cindy Woods	NWS
Vankita Brown	NWS
Mike Sowko	NWS
Kenneth Widelski	NWS
Corey Holden	FEMA
Richard Engle	Fleet Weather Center
Keith Williams	Fleet Weather Center