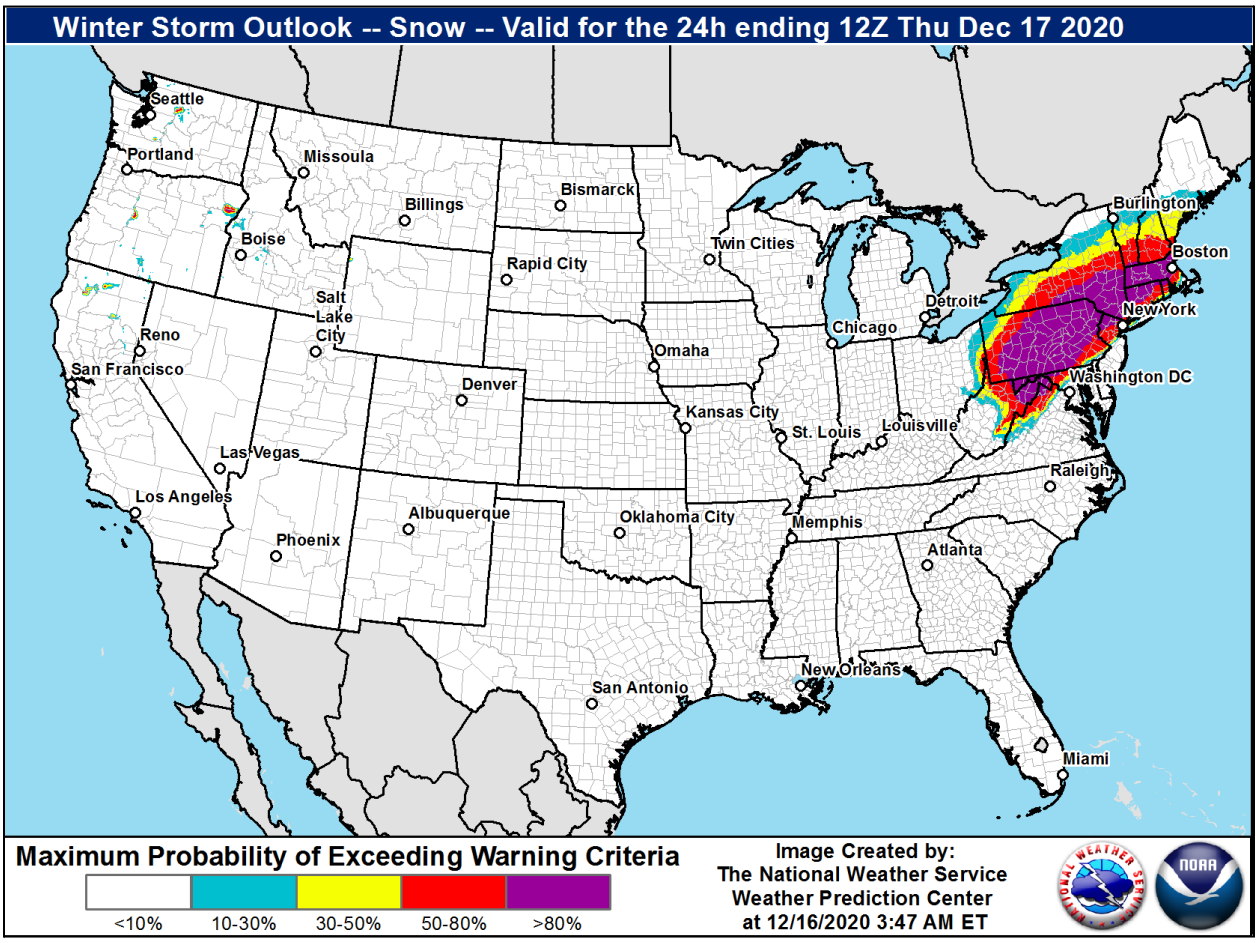
Experimental Winter Storm Outlook (WSO)
Product Description Document (PDD)
October 2022

Part I - Mission Connection

a. <u>Product Description</u> – The Experimental WSO is based on a combination of the Weather Prediction Center's (WPC's) Probabilistic Winter Precipitation Forecasts (PWPF) and local National Weather Service (NWS) snow and ice accumulation warning criteria. Therefore, the WSO provides an early alert to hazardous winter weather conditions in a similar fashion to other national center outlooks, and also assists with NWS Winter Storm Watch and Warning decision making. An example of the WSO is shown below.

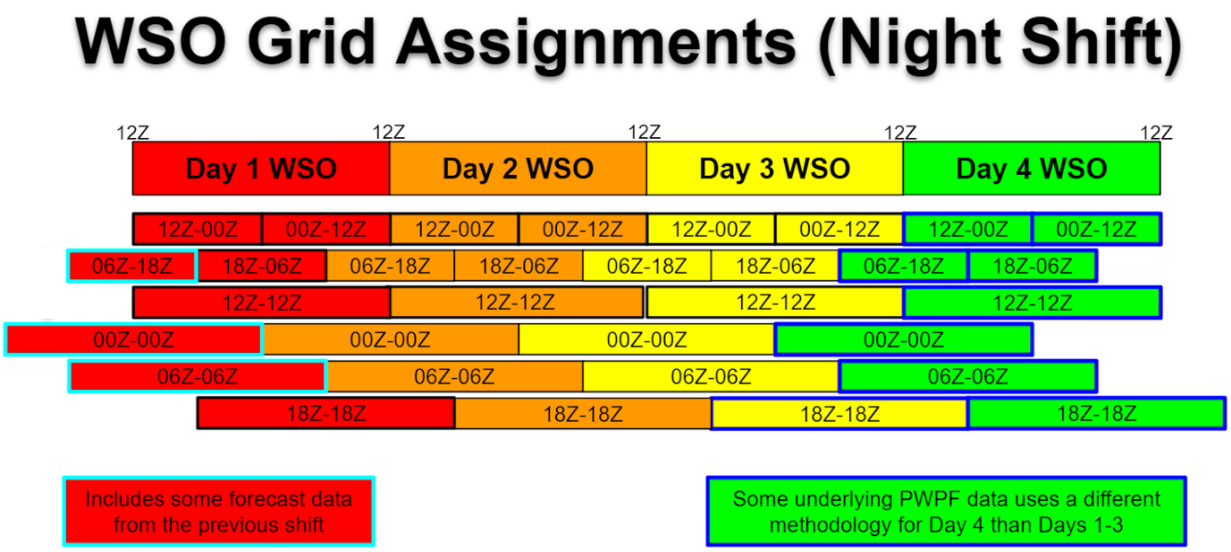


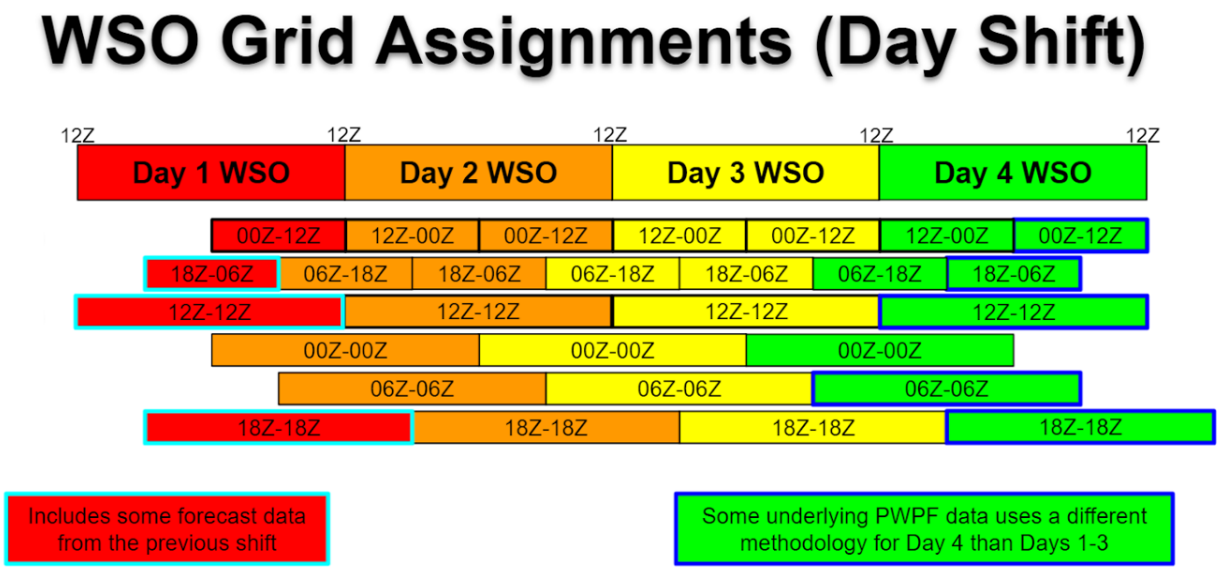
The WSO will exploit a robust winter weather ensemble specifically tuned to Weather Forecast Office (WFO) Winter Storm Warning criteria. This year, in anticipation of implementing a modernized snow criteria that involves a migration from 12- and 24-hour criteria to a new event-based version (a qualifying winter storm event will be considered to be no longer than 48 hours), the WSO will be informed by the proposed new criteria. Ice accumulation criteria was

already event-based, and previous versions of the WSO used the same underlying criteria for 12- and 24-hour accumulation periods.

Therefore, the outlooks will now depict the probability of exceeding event-based Winter Storm Warning criteria for both snow and ice over the next four days for any given location in the contiguous United States (CONUS). PWPF, already utilized by WFOs across the NWS, forms the foundation of WPC's WSOs while WFOs retain Winter Storm Watch issuance responsibility.

WPC will issue four individual 24-hour outlooks on the night shift (one each for Day 1, 2, 3 and 4 with 1200 to 1200 Coordinated Universal Time (UTC) valid times). The underlying data for the probabilities of exceeding local warning criteria is produced for each 6-hour time step, and these grids will be assigned to an outlook period to provide an initial WSO (see images below). The time assignments will help to identify events that cross the 12 UTC threshold. These four outlooks will be subsequently updated on the day shift for the same valid times. To depict storms that stretch across multiple days, WPC will also produce a maximum probability across all time ranges (Days 1 to 4). WPC forecasters will edit and disseminate these outlook forecasts.





Deadline for Day Shift Issuance of WSO: 2100 UTC.

Deadline for Night Shift Issuance of WSO: 0900 UTC.

WPC will team with the NWS Winter Program, Regions, and WFOs to conduct evaluation and verification of both winter storm outlooks and watches, which will inform any future changes to the product as needed.

b. Purpose – The WSO grids serve as an important tool for the improvement of NWS Winter Storm Watch consistency and accuracy across the CONUS. If these activities show continued promise and are accepted and aligned with a fully integrated NWS field structure, then WPC WSOs can serve as the foundation for greater Winter Storm Watch collaboration. Continued development and evolution of the WPC winter weather outlook products will also serve the agency's mission to merge probabilistic hazards information with winter weather impacts information.

c. Audience – The product is intended to serve as an enhancement to decision support services being provided to NWS partners in emergency management, broadcast/electronic media, and transportation, as well as the general public.

d. Presentation Format – The WSO debuted December 16, 2019 as a public facing experimental product for the 2019-2020 winter season for all CONUS WFOs. The WSOs for Days 1-4 will be displayed as web-based maps updated twice daily at https://www.wpc.ncep.noaa.gov/wwd/wso. Keyhole Markup Language (KML) and Shapefiles are also available for download. No changes have been made to the product format for the 2022-23 review period.

e. Feedback Method – Feedback from users will be collected via a NWS web-based survey at:

https://www.surveymonkey.com/r/winterstormoutlook2022-2023

Comments or questions regarding the experimental WSO can be also addressed to:

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Part II – Technical Description

a. Format and Science Basis – The WSO will depict areas of equal point probabilities (10%, 30%, 50%, 80%) for meeting local Winter Storm Warning criteria within a 12 UTC to 12 UTC period. WPC will issue daily outlooks for Day 1, 2, 3, 4 (12-12 UTC) for both snow and ice. WPC will also produce a maximum probability across all time ranges (Days 1 to 4).

The WSO is supported by the WPC PWPF, which is based on an ensemble of model forecasts and the deterministic snow and ice forecasts from the WPC Winter Weather Desk (WWD). For the Day 1 to 3 period, the model forecasts provide the variance of the probability distribution, while the WWD forecast sets the mode of the distribution. For the Day 4 period, the methodology used to create the WSO is similar to that for Days 1-3. However, since WPC does not produce deterministic snow and ice forecasts for Day 4, the ensemble-mean (derived from the same ensemble membership of the PWPF) snow and ice forecasts are used as the distribution mode. More detailed technical information on PWPF is available at the following link: https://www.wpc.ncep.noaa.gov/pwpf/about_pwpf_products.shtml.

PWPF for 12- and 24-hour snow and ice accumulation is compared to event-based local warning criteria to produce a probability of exceeding that criteria at each six hour time step. These detailed probability grids are then assigned to a specific WSO period based on the timing of maximum expected accumulation, as described in the graphics above. The time assignment of all the underlying grids improves the alignment of winter storms with expected accumulations across two successive WSO periods (i.e., the timing of the heaviest expected accumulation is centered close to the 12 UTC time boundary).

To mitigate potential issues with an updated Day 1 WSO not depicting ongoing winter storm conditions, some probability grids from the previous shift will be used for the start of the Day 1 period.

b. Availability – The WSO will be provided externally to users through a WPC webpage at https://www.wpc.ncep.noaa.gov/wwd/wso/. KML and Shapefiles are also available for download. WPC will develop verification statistics and a WSO product archive.