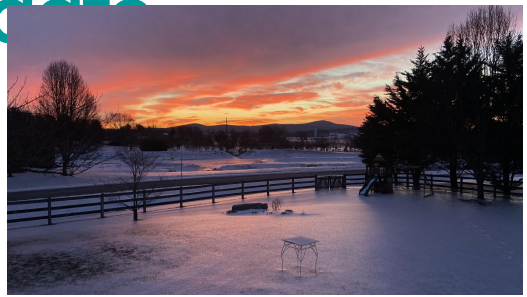
The NWS National Winter Weather Program:

2024-2025 Winter Season Update



Winter Weather Experiment Seminar Series
February 25, 2025

Eric Guillot
Winter Weather Program Lead

Severe, Fire, Public, and Winter Weather Services Branch (AFS21)
Forecast Services Division (AFS2)

What Does the Winter Weather Program Do?

- The Winter Weather program is responsible for services related to NWS winter products provided by both WFOs and National Centers. This is accomplished by working with the **Winter Service Program Team (SPT)** , made up of representatives from each NWS Region, NCEP, and NWSEO.

- **All things related to winter services** have to come through the Winter Program and Winter SPT

- The Winter Weather Program works to improve winter products and services through the **evaluation of new experimental products** , **collaboration initiatives** (especially between National Centers and WFOs), **working with other NWS Headquarters Portfolios** , and by **leading teams and working groups** to address current issues with NWS winter products and services.

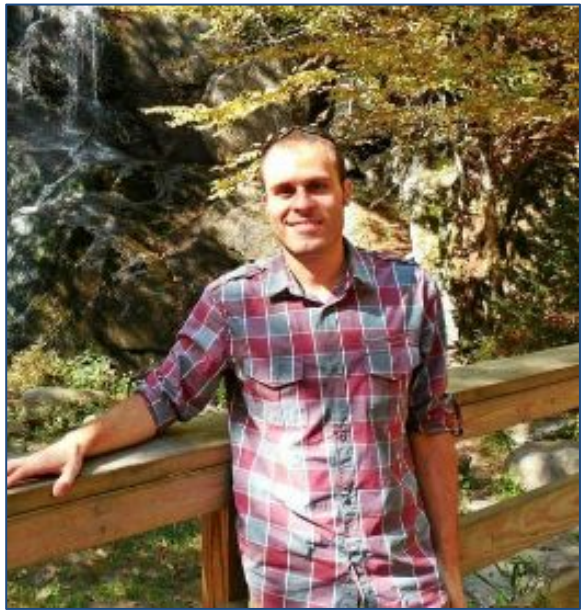
Winter Weather Program Vision Statement

The delivery of winter forecast services that are collaborative , probabilistic , and impact-based .

Winter Weather Program HQ Staff

Eric Guillot
Eric.Guillot@noaa.gov

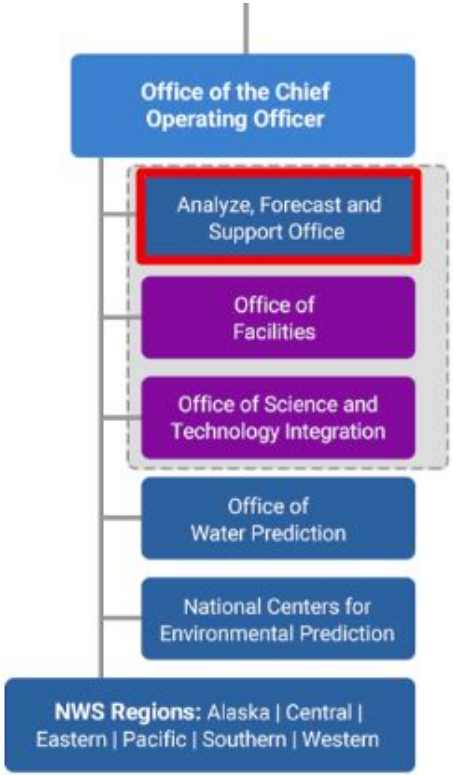
Winter Weather Program Lead

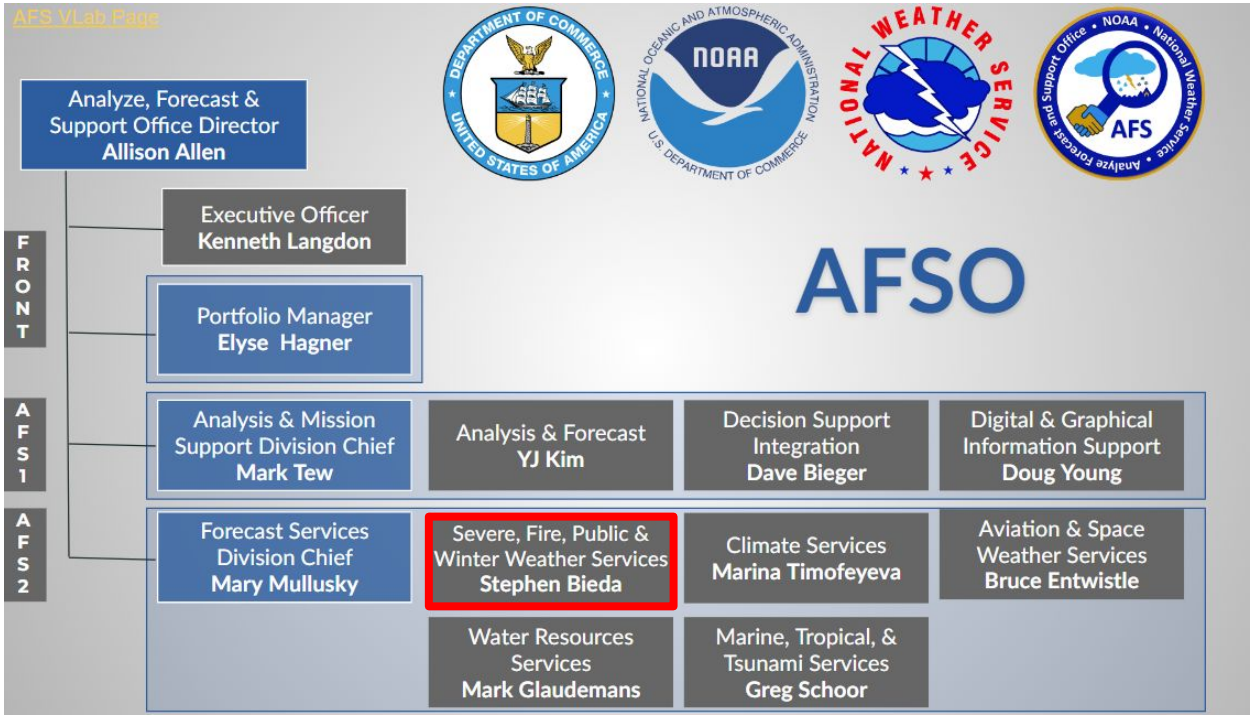


Michael Muccilli
Michael.Muccilli@noaa.gov

Winter Weather Program Coordinator

Where Does the Winter Program Sit?





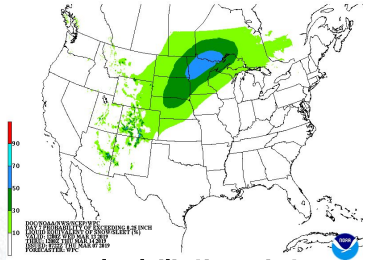
The Winter Probabilistic Data "Story"

The era of objective and probabilistic winter hazard information has arrived!

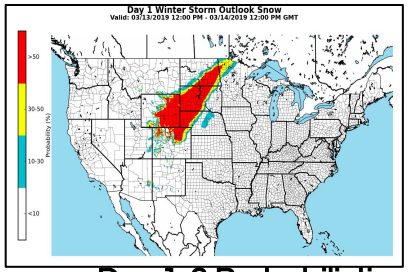
Forecast Lead Time Prior to Winter Event

7 Days | **1-3 Days** | **Hours**

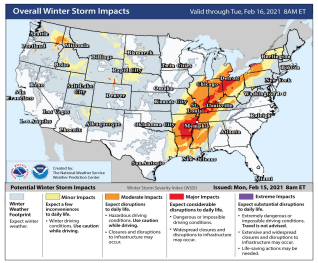
Day 4-7 Probabilistic Winter Weather Outlook &



Day 1-4 Probabilistic Winter Storm Outlook

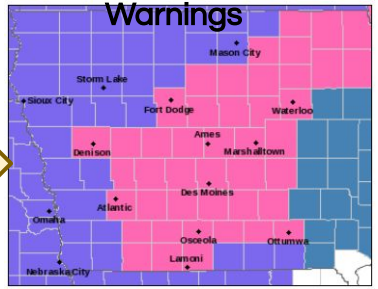


Day 1-3 Winter Storm Severity Index

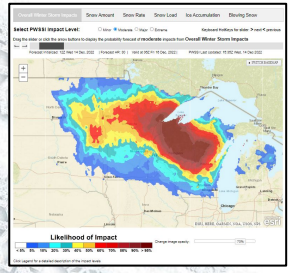


Informs

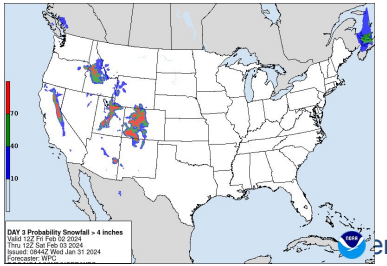
Winter Storm Watches / Winter Storm Warnings



Day 1-7 Probabilistic Winter Storm Severity Index

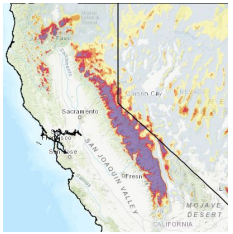
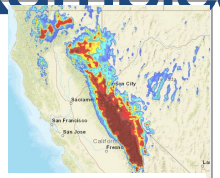
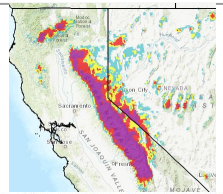
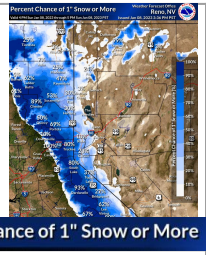


Day 1-3 Probabilistic Snowfall



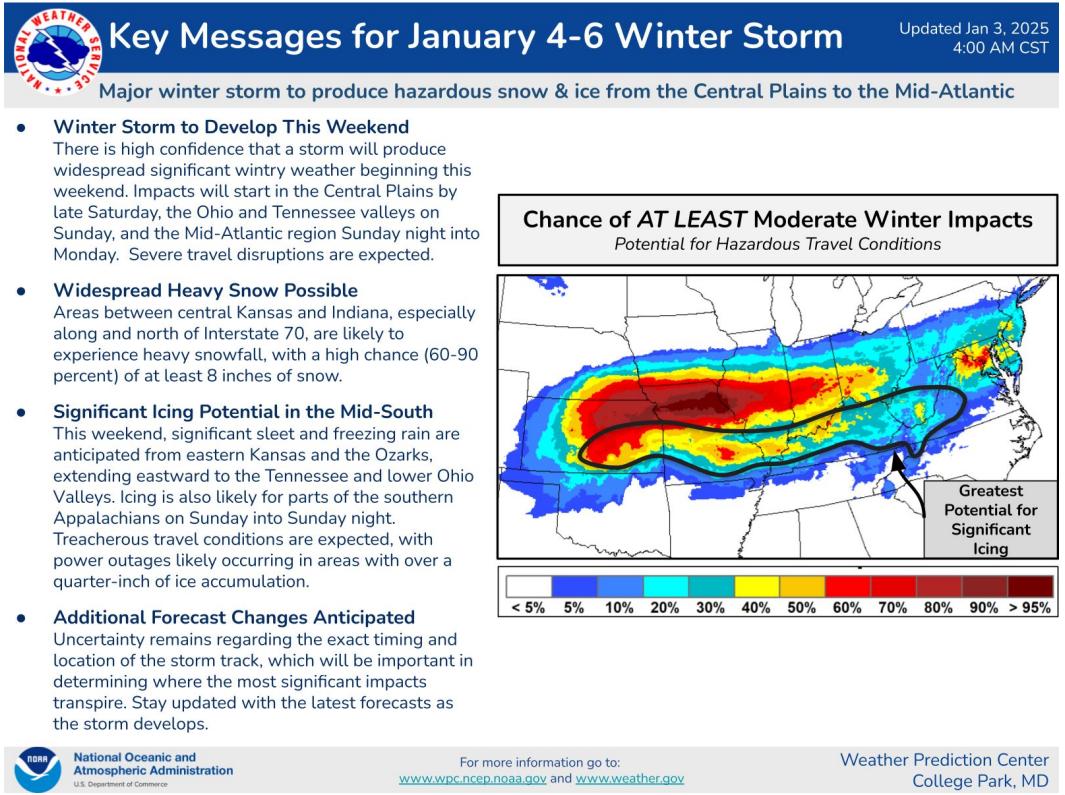
Mesoscale Snowfall Discussion

Winter Research to Operations Product Examples

Product	Winter Storm Severity Index (WSSI)	Probabilistic WSSI (WSSI-P)	Winter Storm Outlook (WSO)	Probabilistic Precipitation Portal (PPP)
				
Status	Operational (research and improvements continue)	Operational (research and improvements continue)	Experimental (External) (SBES work wrapping up)	Experimental (External) (improvements ongoing)
Source	NDFD forecasts, GIS data, climatology	61 member ensemble, GIS data, climatology	61 member ensemble, watch/warning snow criteria	61 member ensemble, ensemble mode is the NDFD forecast
Output	Impact categories for Days 1-3 forecast period: Winter Weather Area, Minor, Moderate, Major, Extreme	Probability of impact categories for Days 1-7 forecast period: Winter Weather Area, Minor, Moderate, Major, Extreme	Probability of exceeding Winter Storm Watch / Warning criteria for Days 1-4 forecast period	• 10th percentile (high-end snow amount) • 90th percentile (low-end snow amount) • Mode (expected snow amount) • Probability of exceedance of

Winter Key Messages

- **Goal:** Galvanize partners and the media around a consistent, coordinated message
- Used for high-impact storms that are expected to cause travel disruptions or pose a hazard to life and property and/or are rare events
- Collaborated among WFOs & WPC and integrated for consistent messaging
- Available on WPC website and across Social Media platforms (if active)
- **No changes this year**

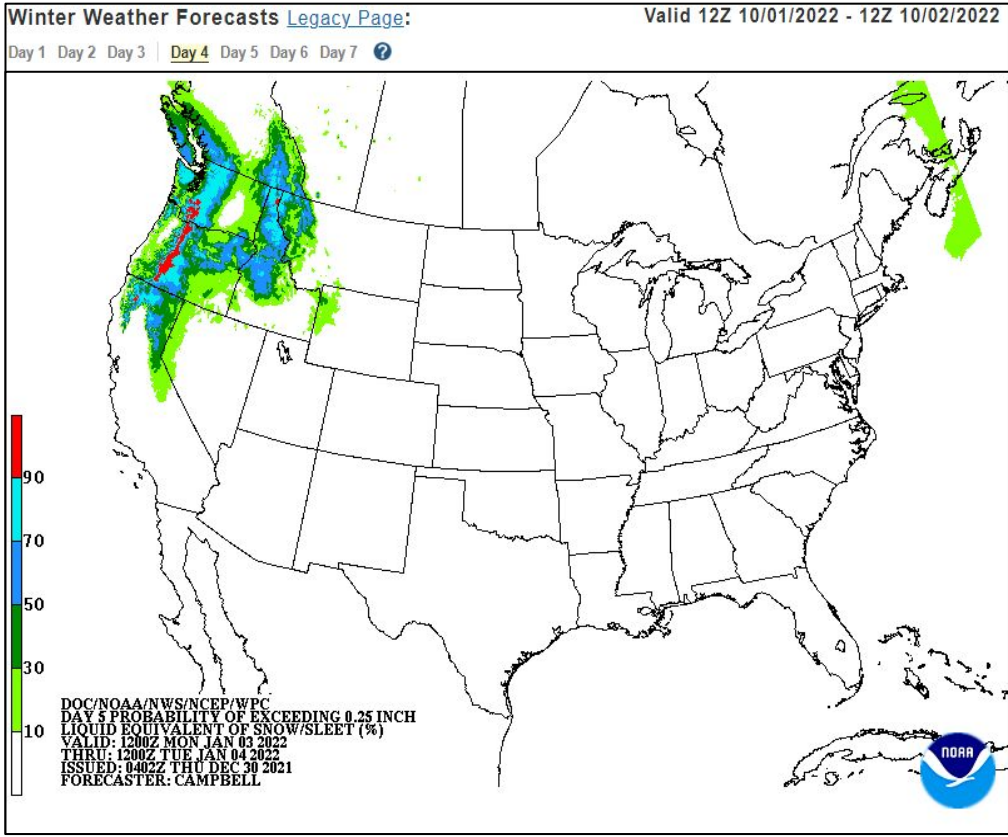


Available here :

https://www.wpc.ncep.noaa.gov/key_messages/LatestKeyMessage_1.png
https://www.wpc.ncep.noaa.gov/key_messages/LatestKeyMessage_2.png

Days 4-7 Winter Weather Outlook

- **Goal:** Supports advanced planning of hazardous winter weather for both internal NWS and external partners
- Web-based, graphical, probabilistic forecast depicting the probability of winter precipitation (snow & sleet) exceeding 0.25 inches (~6 mm) water equivalent over a 24-hour period (12Z–12Z)
- Four separate graphics produced twice daily showing the forecast for Days 4, 5, 6 and 7
- **No changes this year**



Winter Weather Outlook Page:

https://www.wpc.ncep.noaa.gov/wwd/pwpf_d47/pwpf_medr.php

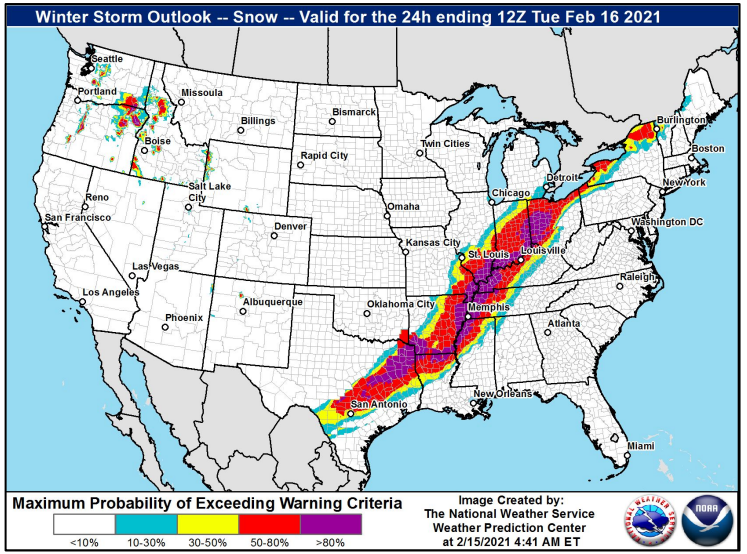
Experimental Winter Storm Outlook (WSO)

- **Goal:** Display the probability of realizing hazardous snow/ice accumulations using WFO-specific Watch/Warning criteria as a proxy threshold.

- Provides a Days 1-4 "Outlook" product in the Winter Program, serving to unify both external messaging and internal collaboration for consistent and collaborative Winter Storm Watch issuance.

- The WSO uses the event-based heavy snow watch/warning criteria as part of the evaluation (see: weather.gov/snow-criteria)

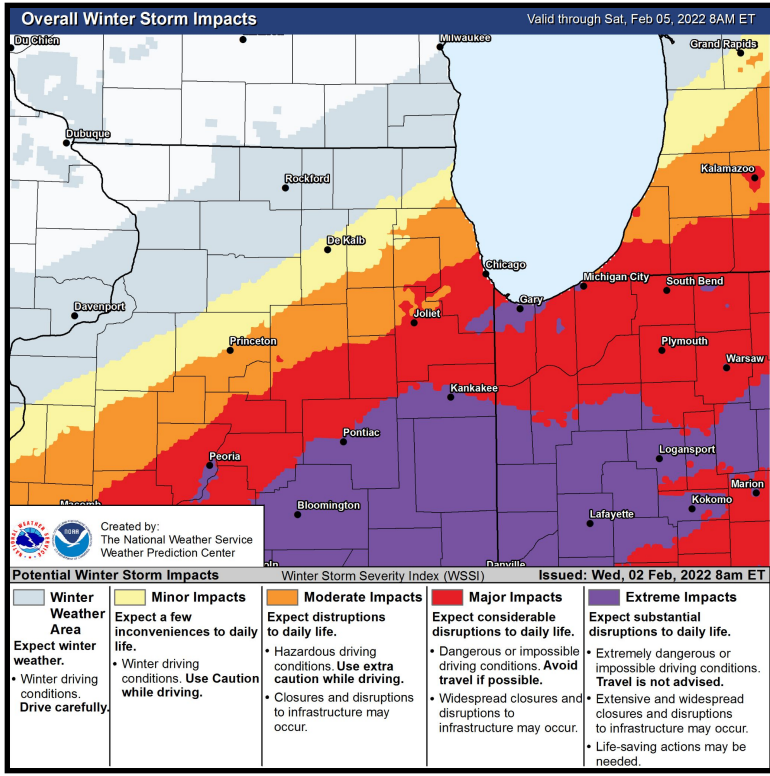
- **2025 Update:** Social science focus groups are involving partners to determine future changes to this product, possibly incorporating WSSI-P output to create a true Days 1-7 Outlook.



Available here :
https://www.wpc.ncep.noaa.gov/wwd/wso

Winter Storm Severity Index (WSSI)

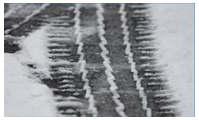
- **Goal:** Forecast the ***severity*** of community impacts from winter storms throughout the continental United States, including tree damage, property damage, transportation impacts, and disruptions to daily life
- The WSSI provides output for Days 1-3 (and also in 24 hour intervals) is updated every two hours, and incorporates the local snowfall forecast into its output
- The summary graphic is a composite of the maximum impact from any of the six components
- **Improvements coming March 17, 2025** :
- Snow Amount / Ice Accumulation includes prior 12-hrs
- Updated tree type and land cover datasets
- Snow Load accounts for preexisting snow
- Blowing Snow / Ground Blizzard accounts for duration of impacts
- Wind factor as a part of Snow Load / Ice Accumulation
- Population density & average traffic part of Snow Amount / Ice Accumulation



Available here: www.weather.gov/wssi

WSSI Components & Scale

Ground Blizzard
Indicates the potential travel-related impacts of strong winds interacting with pre-existing snow cover



Flash Freeze
Indicates the potential of flash freezing during or after precipitation events.

Blowing Snow
Indicates the potential disruption due to blowing and drifting snow

Ice Accumulation
Indicates potential infrastructure impacts due to combined effects and severity of ice and wind

Snow Load
Indicates potential infrastructure impacts due to the weight of snow

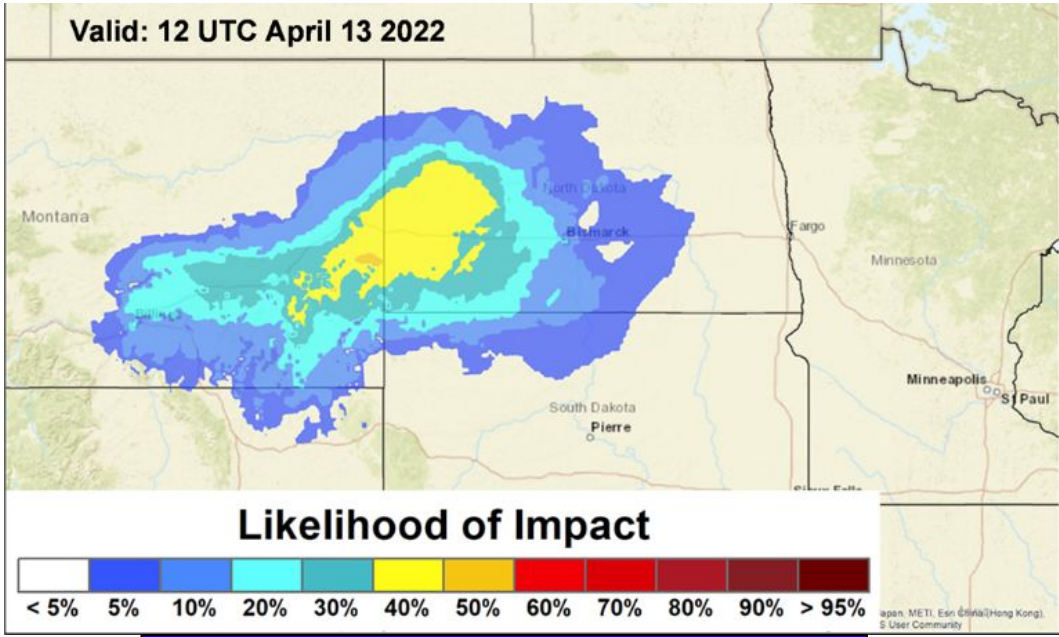
Snow Amount
Indicates potential impacts due to the total amount of snow or snow accumulation rate

Potential Winter Storm Impacts	
	Winter Weather Area **Expect Winter Weather.** • Winter driving conditions. **Drive carefully.**
	Minor Impacts **Expect a few inconveniences to daily life.** • Winter driving conditions. **Use caution while driving.**
	Moderate Impacts **Expect disruptions to daily life.** • Hazardous driving conditions. **Use extra caution while driving.** • Closures and disruptions to infrastructure may occur.
	Major Impacts **Expect considerable disruptions to daily life.** • Dangerous or impossible driving conditions. **Avoid travel if possible.** • Widespread closures and disruptions to infrastructure may occur.
	Extreme Impacts **Expect substantial disruptions to daily life.** • Extremely dangerous or impossible driving conditions. **Travel is not advised.** • Extensive and widespread closures and disruptions to infrastructure may occur. • Life-saving actions may be needed.

Impact definitions

Probabilistic Winter Storm Severity Index (WSSI-P)

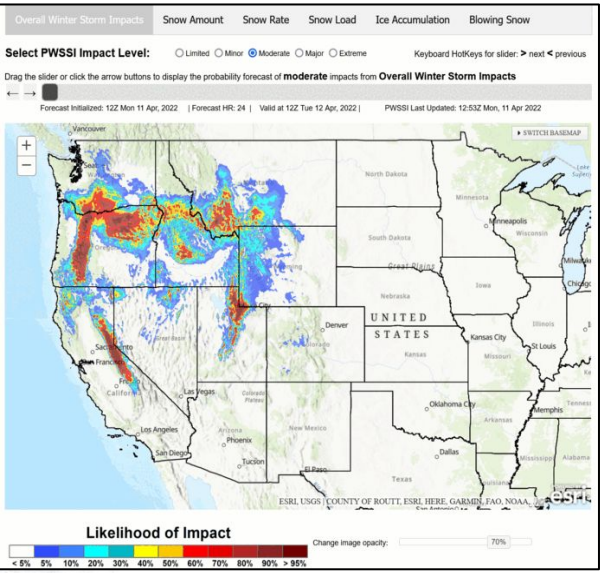
- **Goal:** Forecast the ***probability*** of reaching community impact from winter storms throughout the continental United States using the WSSI impact thresholds
- Produces five different levels of impact probabilities for Snow Amount, Snow Rate, Snow Load (heaviness), Ice Accumulation, and Blowing Snow
- The WSSI-P provides output for Days 1-7 in six hour intervals and is updated four times a day.
- **No changes this year**

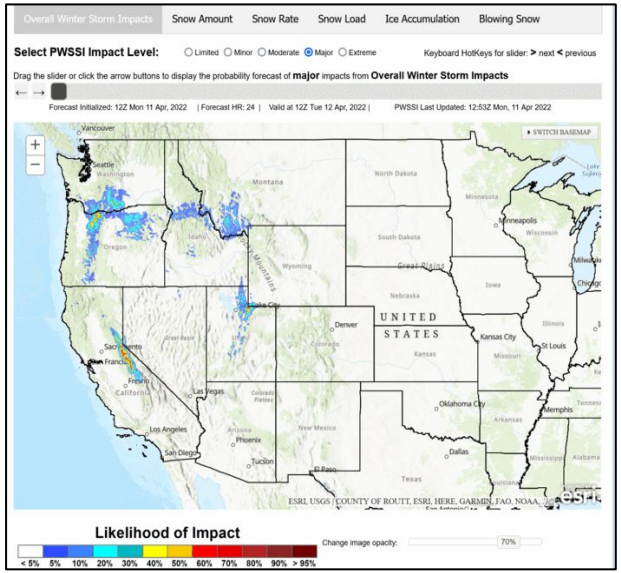


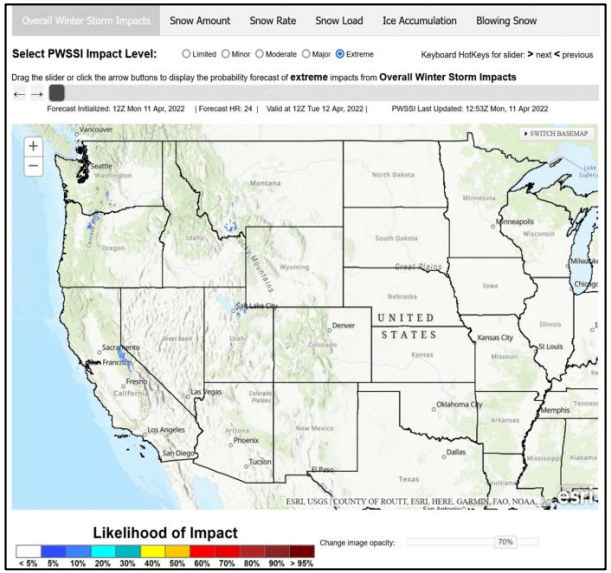
High Probabilities of Minor provide an envelope of expected impacts

Available here :
https://www.weather.gov/wssi-p

Example of WSSI-P Impact Probabilities for a Winter Storm







High Probabilities of Moderate depict where there is likely to be disruptions to daily life

High Probabilities of Major or Extreme depict where the most severe impacts are likeliest to occur

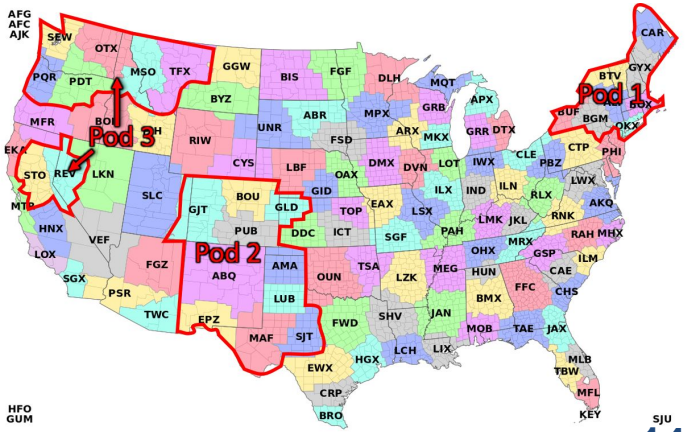
2024-2025 Collaborative Winter Watch Exercise

- **Goal:** WFOs will issue watches after collaborating with the WPC Winter Weather Desk and neighboring WFOs. “Pods” of WFOs participate in this exercise. This is the 3rd year of the exercise!

- **Partner benefits:** Consistency in watch issuance times and spatial coverage for decision makers; consistency among national and local messaging

- **NWS benefits:** Better utilization of winter weather expertise & forecast guidance from WPC; improved coordination with surrounding offices; improved decision support services; no change to WFO operational responsibility

- **2025 Update:** The Exercise will now run for all Pods concurrently for most of the Winter Season (mid November to early March)



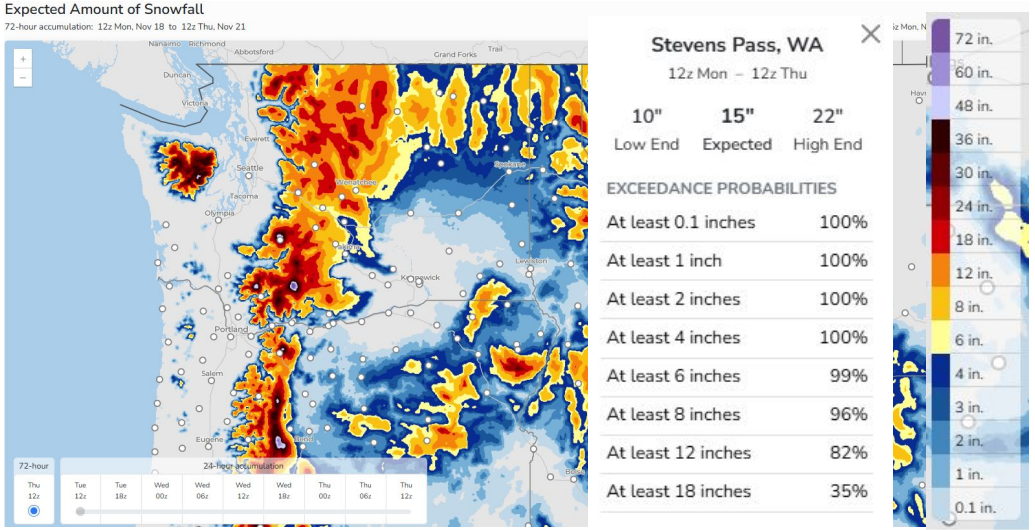
Experimental Probabilistic Precipitation Portal

- **Goal:** A centralized location for the generation of probabilistic snow and liquid precipitation forecasts to provide consistency between WPC and amongst WFOs

- This is where the probabilistic winter precipitation forecast (PWPF) graphics displayed on a local WFO webpage are created

- **2025 Update:** The PPP reached Experimental status and become public-facing on 11/14/24

- The PPP is planned to create probabilistic ice accumulation for the 2025-2026 winter season



Links/Outreach: https://www.weather.gov/prob-snow/

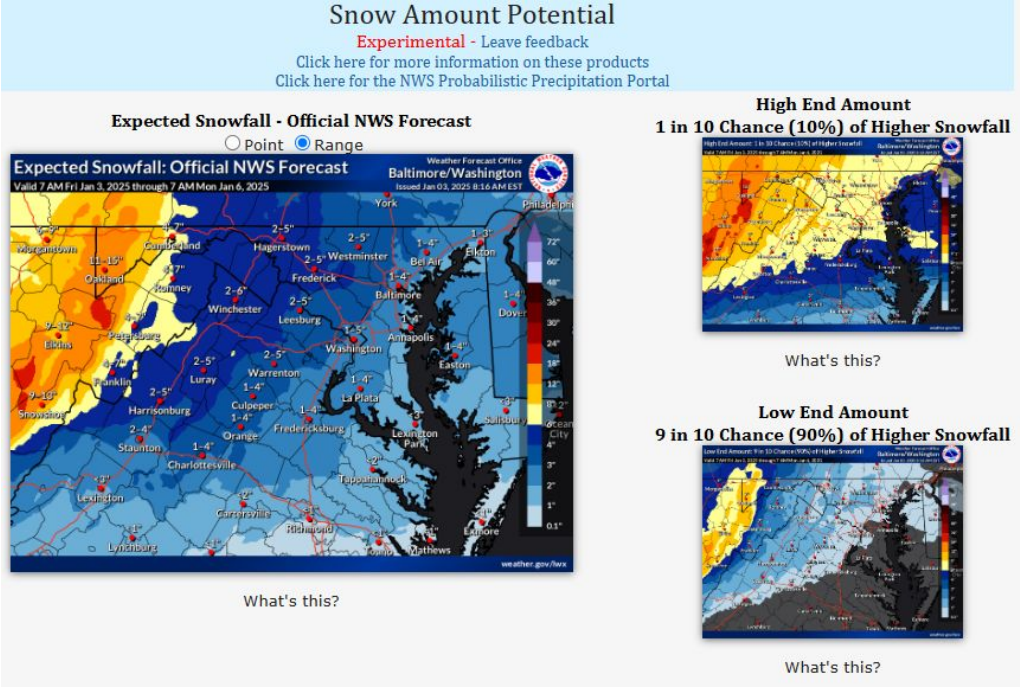
Available here :
https://www.wpc.ncep.noaa.gov/Prob_Precip/

WFO Probabilistic Winter Precipitation Forecast (PWPF)

- **Goal**: Provide partners and public a range of snowfall amounts to better communicate forecast uncertainty during winter weather.

- 61-member ensemble of forecast models
  - WFO official forecast is the statistical "mode" of the cumulative distribution function of probabilities

- Experimental 10th and 90th percentile graphics are available in the National Digital Forecast Database (NDFD).



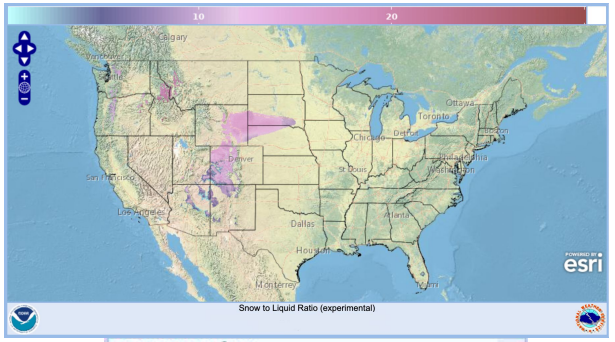
Local office Experimental PWPF page:
https://www.weather.gov/btv/winter

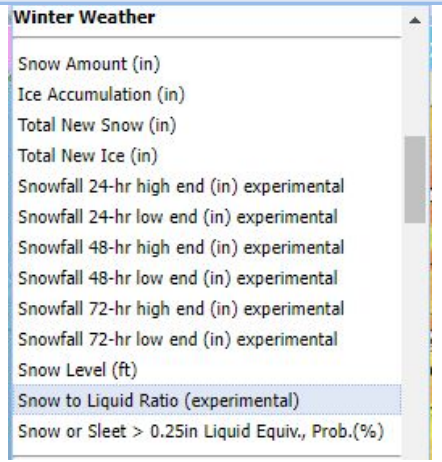
Snow Ratio Grids Experimental Product

- The Snow Ratio gridded product has been Experimental since Fall 2022 in CONUS and OCONUS (expanded due to positive feedback from CR partners)

- Calculated every six hours using the following equation:

$$\text{Snow Ratio} = \frac{\text{Snow06}}{\text{QPF06}}$$





- Simply takes a WFO's 6-hour Snow Amount grid, divides by a WFO's 6-hour QPF Amount grid

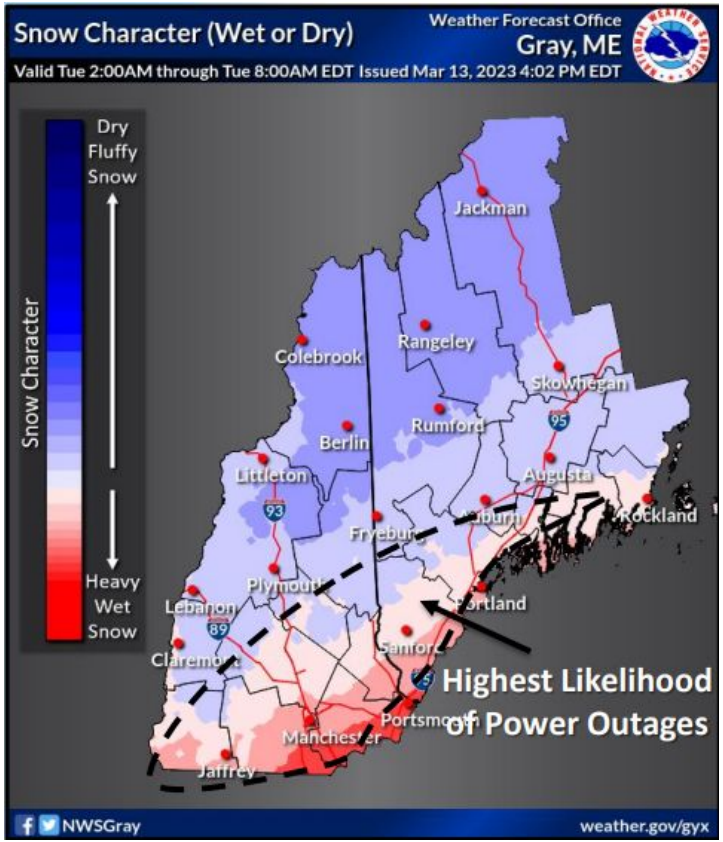
- **Caveat:** QPF amounts must be greater than or equal to 0.1" to avoid data artifacts (Snow Amount is tenths of inches, QPF is hundredths of inches)

Snow Character Maps

- **Goal:** Display the consistency of snow (dry/fluffy or heavy/wet) to better inform partners and the public regarding potential hazardous impacts

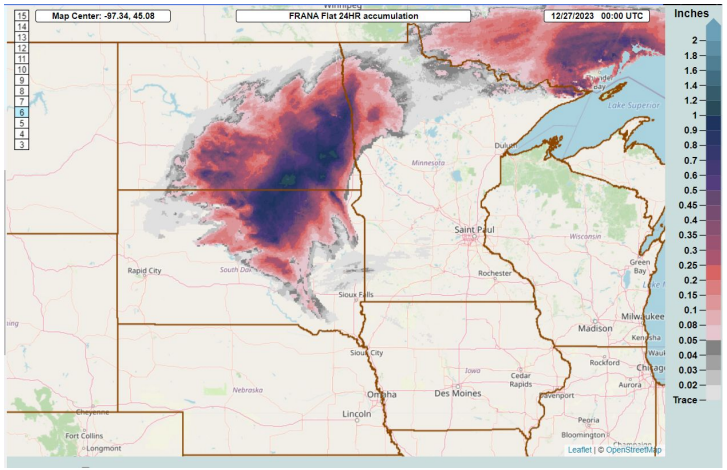
- Maine WFOs have been using these graphics for years **with overwhelmingly positive partner feedback,** and the Winter Program is advocating for more WFOs to begin incorporating them on their local winter website or use them in partner briefings.

- If this is something that you are interested in adopting:
  - Quick Guide
  - Install Guide



R2O - Freezing Rain Accumulation National Analysis

- An experimental Multi-Radar/Multi-Sensor (MRMS) product called the Freezing Rain Accumulation National Analysis (FRANA) is currently being evaluated at most WFOs
- FRANA uses the Freezing Rain Accumulation Model (FRAM) and other MRMS data to calculate ice accumulation (both flat and radial), at 1,3,6,12, and 24 hour intervals for the CONUS in real time
- The Cooperative Institute for Severe and High-Impact Weather Research and Operations (CIWRO) is collecting feedback from NWS forecasters to improve the product for possible operational implementation in the future - available via LDM



Winter Training Initiatives

- 2024-2025 Winter Program Training Requests
  - Probabilistic Precip Portal
  - NBM Winter Weather Elements
  - Winter Mesoanalyst Course

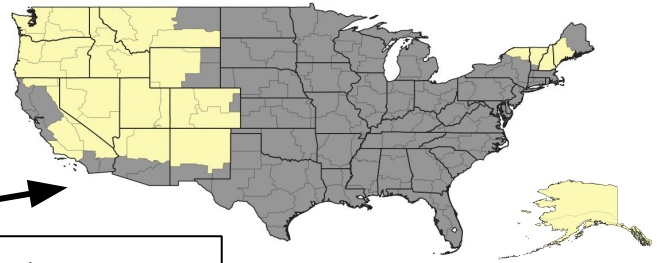
Avalanche Weather Initiative

Avalanche Weather Guidance

- Provides partners & public with forecast weather parameters critical to avalanche center prediction of avalanche conditions, risk, mitigation, & recovery.
- Forecast Elements may include: temperature, weather, probability of precipitation, snowfall, liquid or snow-water equivalent, ice accumulation, snow level, winds, & cloud cover.
- Optional:
  - Forecast Discussion
  - Long Term Extension to Day 7
  - Probabilistic Snowfall Forecasts

...Mount St. Helens...

Date	Friday 09/23								Saturday 09/24			
Time (LT)	06	09	12	15	18	21	00	03	06	09	12	15
	6a	9a	12	3p	6p	9p	12	3a	6a	9a	12	3p
Cloud Cover	SC	FW	SC	SC	SC	SC	SC	SC	FW	SC	SC	SC
Cloud Cover (%)	40	15	30	30	40	40	35	30	25	25	30	30
Temperature	40	44	49	51	49	45	45	44	44	49	55	57
Max/Min Temp					51				44			
Wind Dir	W	NW	W	W	NW	W	NW	NW	NW	NW	S	SW
Wind (mph)	8	4	4	6	5	5	8	8	5	2	3	4
Wind Gust (mph)	20			16			19	17				
Precip Prob (%)	10	5	10	10	10	10	10	10	10	5	5	0
Precip Type												
12 Hour QPF					0.00				0.00			
12 Hour Snow					0.0				0.0			
Low End Snow					0.0				0.0			
High End Snow					0.0				0.0			
12 Hour Ice					0.00				0.00			
Snow Level (kft)	8.5	8.5	9.5	10.0	10.0	10.0	10.0	10.0	9.6	10.5	11.0	11.0



Offices that produce the AVG in Yellow. If you are an avalanche partner, **work with your WFO** for more information or to set up forecast areas.

Avalanche Weather Initiative

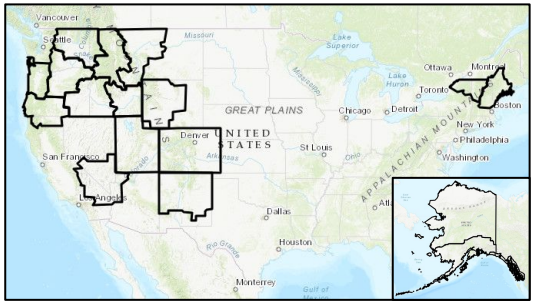
Experimental Avalanche Weather Web Pages

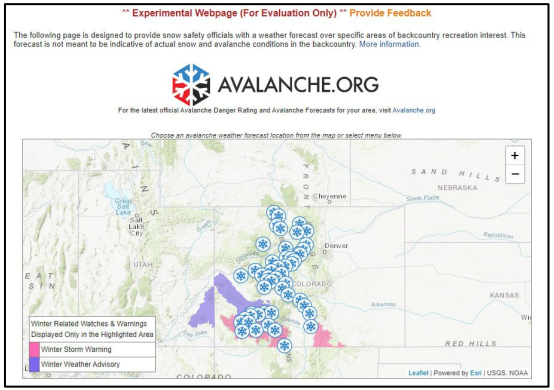
www.weather.gov/wrh/AvalancheWeather

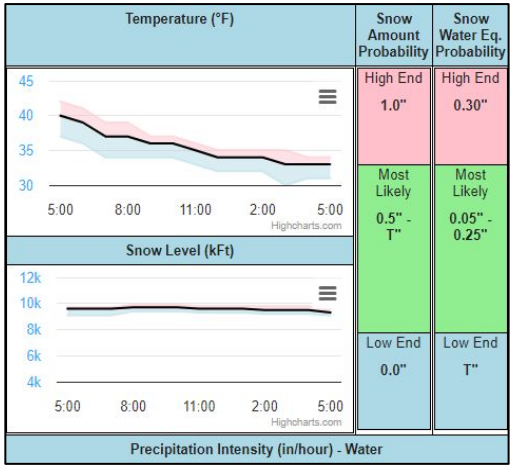
- Critical sources of information for partners & public to easily obtain avalanche weather products & information

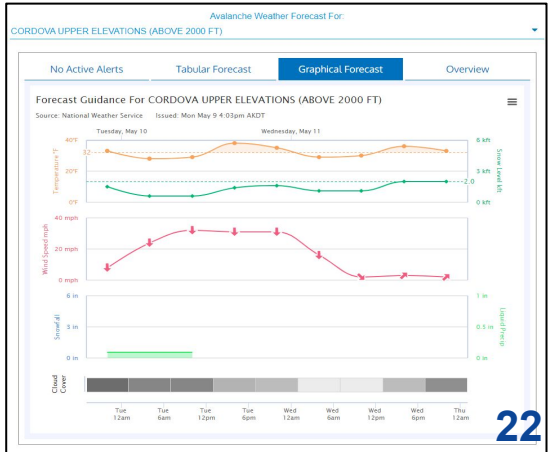
- Includes: NWS weather alerts, avalanche center avalanche alerts, clickable points or polygons, relevant weather discussion, precipitation summary tables, a tabular & graphical forecast, & a local content section

- **2025 Update:** Optional Probabilistic Display







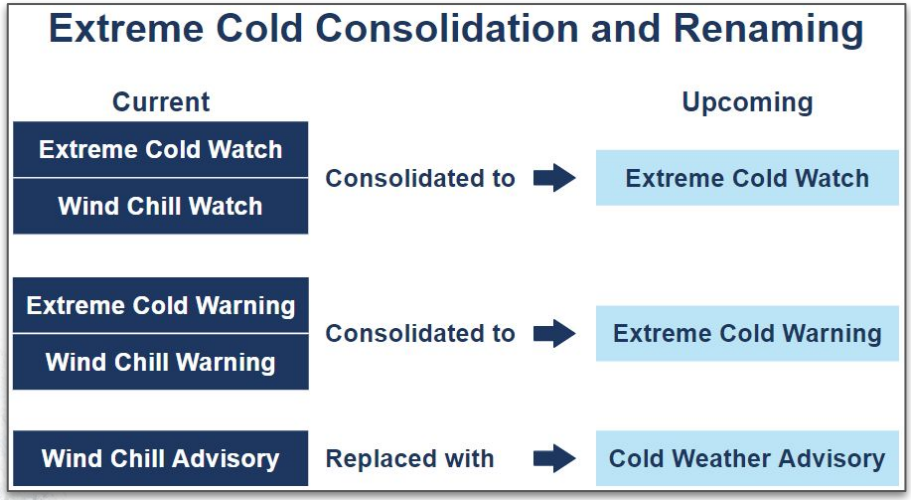


Feedback:

https://www.surveymonkey.com/r/ExpStandardizedWFOAvalancheWeatherWebpage_2024-2025

Wind Chill → Extreme Cold

As of October 1, 2024, the NWS simplified its suite of cold weather products to improve messaging of these hazards and provide better decision support services



Extreme Cold Criteria

Why Do This?

- Emphasizes that **cold is dangerous** , with or without wind
- **Simplifies messaging** by using a single product type
- Develops **new, consistent guidance** that is based on climatology ***and*** adjusted for impacts

All cold products have officially moved to the Public Program with latest update of NWSI 10-513

Annual Winter Program Events

- Annual Winter Program Meeting
  - Held for the past nine years in either May or June for 3-4 half days
  - All NWS SOOs, WCMs, and Winter Focal Points are invited
  - Last year's speaker topics included:
    - Seasonal review from each Region
    - Collaborative Watch Exercise summary
    - Product updates, including WSSI, WSSI-P, the PPP, and NBM v4.2
    - Winter Program ice initiatives and Winter Storm Outlook work
    - Breakout sessions regarding Enhanced Wording for Winter Storms

- Annual Winter Partners Webinar (held on 10/17/24, 800+ attendees)
  - Held yearly in October, (usually the same day as the CPC Winter Outlook release)
  - Open to the public, targeting Emergency Managers and decision makers
  - Highlights important winter product/policy changes for the season

Contact Information

Eric Guillot:
eric.guillot@noaa.gov

Mike Muccilli:
michael.muccilli@noaa.gov

Important Links

NWS Key Messages
https://www.wpc.ncep.noaa.gov/key_messages/LatestKeyMessage_1.png
https://www.wpc.ncep.noaa.gov/key_messages/LatestKeyMessage_2.png

Days 4-7 Winter Weather Outlook
https://www.wpc.ncep.noaa.gov/wwd/pwpf_d47/pwpf_medr.php

Experimental Winter Storm Outlook
https://www.wpc.ncep.noaa.gov/wwd/wso

Winter Storm Severity Index
www.weather.gov/wssi

Probabilistic Winter Storm Severity Index
https://www.weather.gov/wssi-p

Local Probabilistic Snow
https://www.weather.gov/prob-snow/

Avalanche Weather
www.weather.gov/wrh/AvalancheWeather

NDFD Products:
https://digital.weather.gov