881. The Winter 2014-2015 NWS Probabilistic Storm Total Snowfall Forecast Experiment
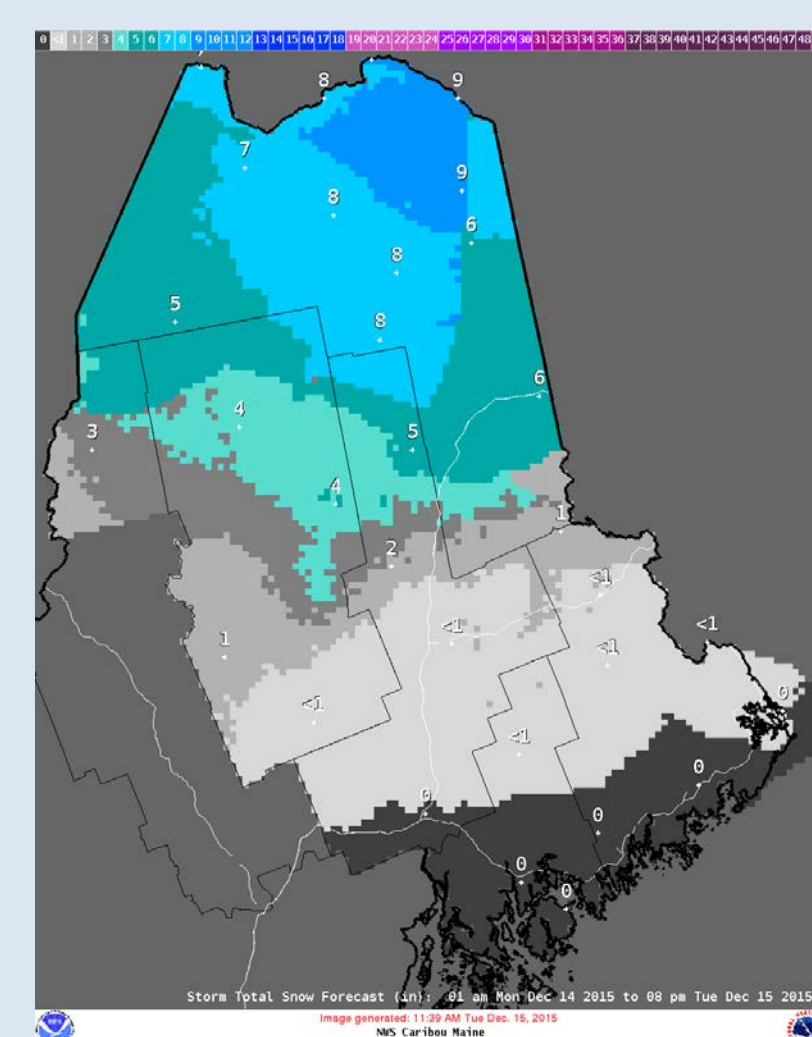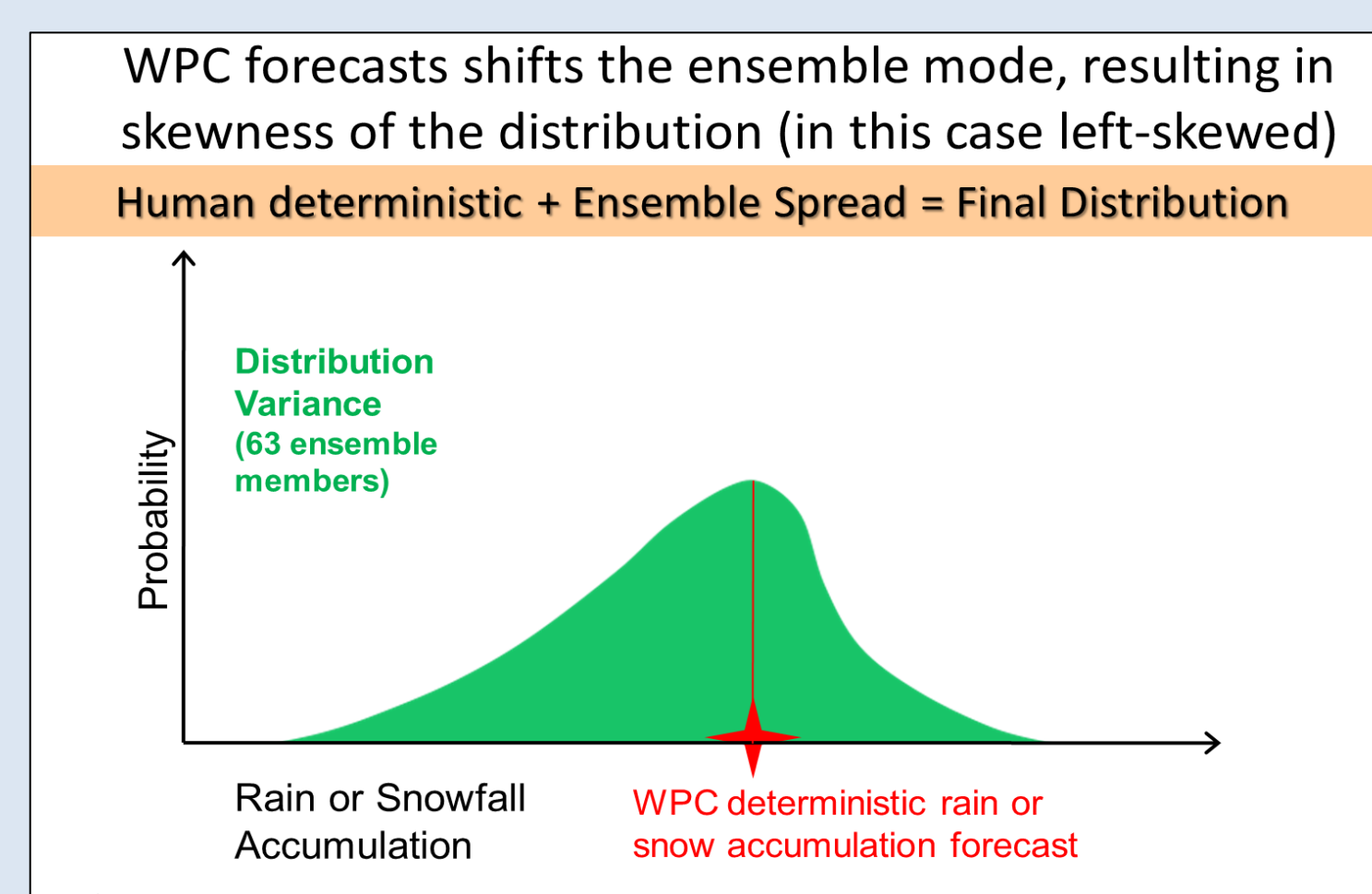
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EXPERIMENT GOALS

- **Quantify and communicate forecast uncertainty in our snowfall products and services.**
- **Introduce key stakeholders to probabilistic information for effective decision making to help mitigate risks.**
- **Align with key strategic WRN IDSS initiative to expand and optimize use of probabilistic forecast guidance.**

1. METHODOLOGY/FORECAST PROCESS

WPC generates ensemble-derived PDF from a 62-member ensemble. Percentile accumulations and probability of exceedance amounts are derived from the PDF and sent to AWIPS/GFE. A cumulative distribution function (CDF) is created.
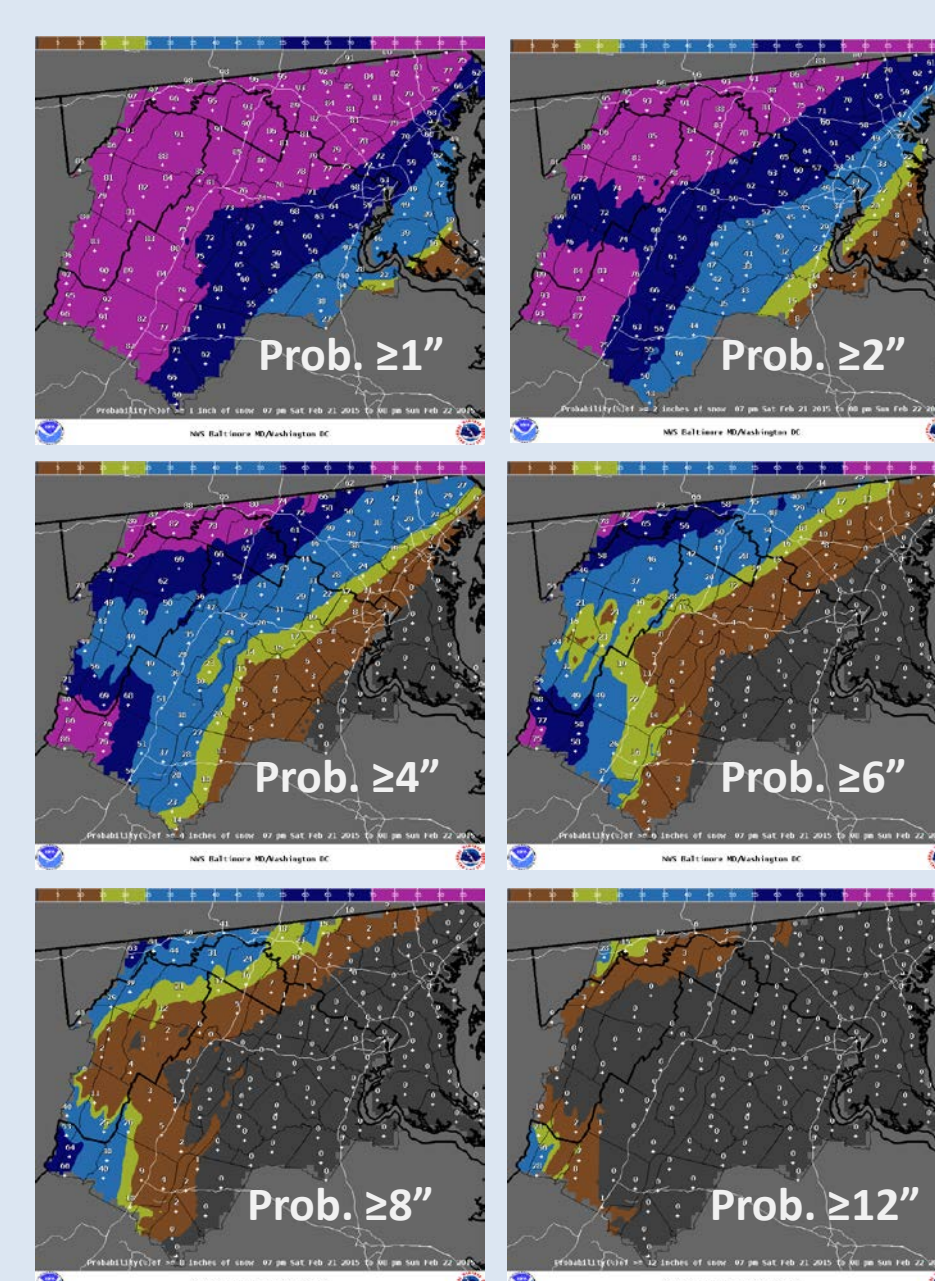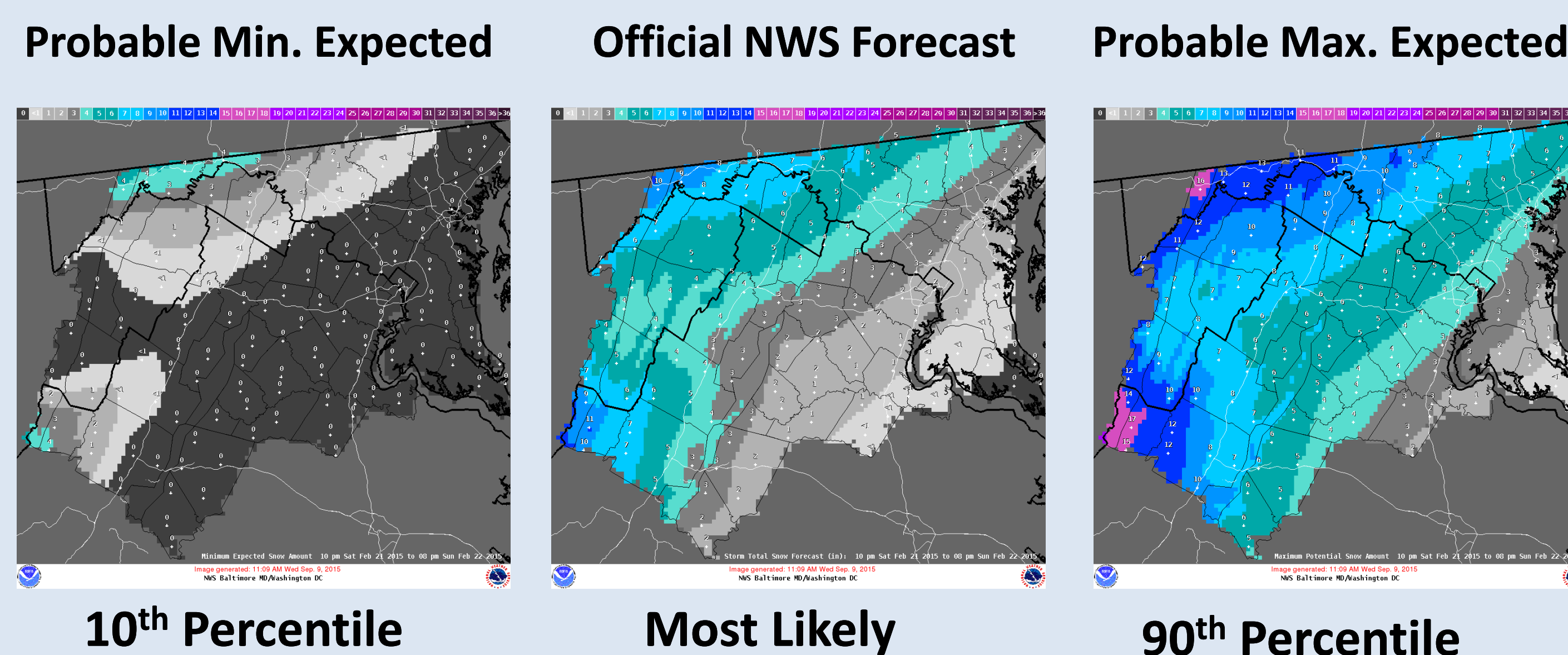
WPC forecasts shifts the ensemble mode, resulting in skewness of the distribution (in this case left-skewed)
Human deterministic + Ensemble Spread = Final Distribution

Distribution Variance (63 ensemble members)

Probability

Rain or Snowfall Accumulation

WPC deterministic rain or snow accumulation forecast

The official WFO Storm total snowfall amount is created.

Example Cumulative Distribution Functions

Probability

Storm Total Snow Amount

The WPC ensemble-derived CDF is shifted to create a new, adjusted CDF at each grid point, re-centered on the official WFO storm total snow amount. Exceedance probabilities, percentile amounts and a suite of graphics depicting a best, worst, and most likely scenario are output.
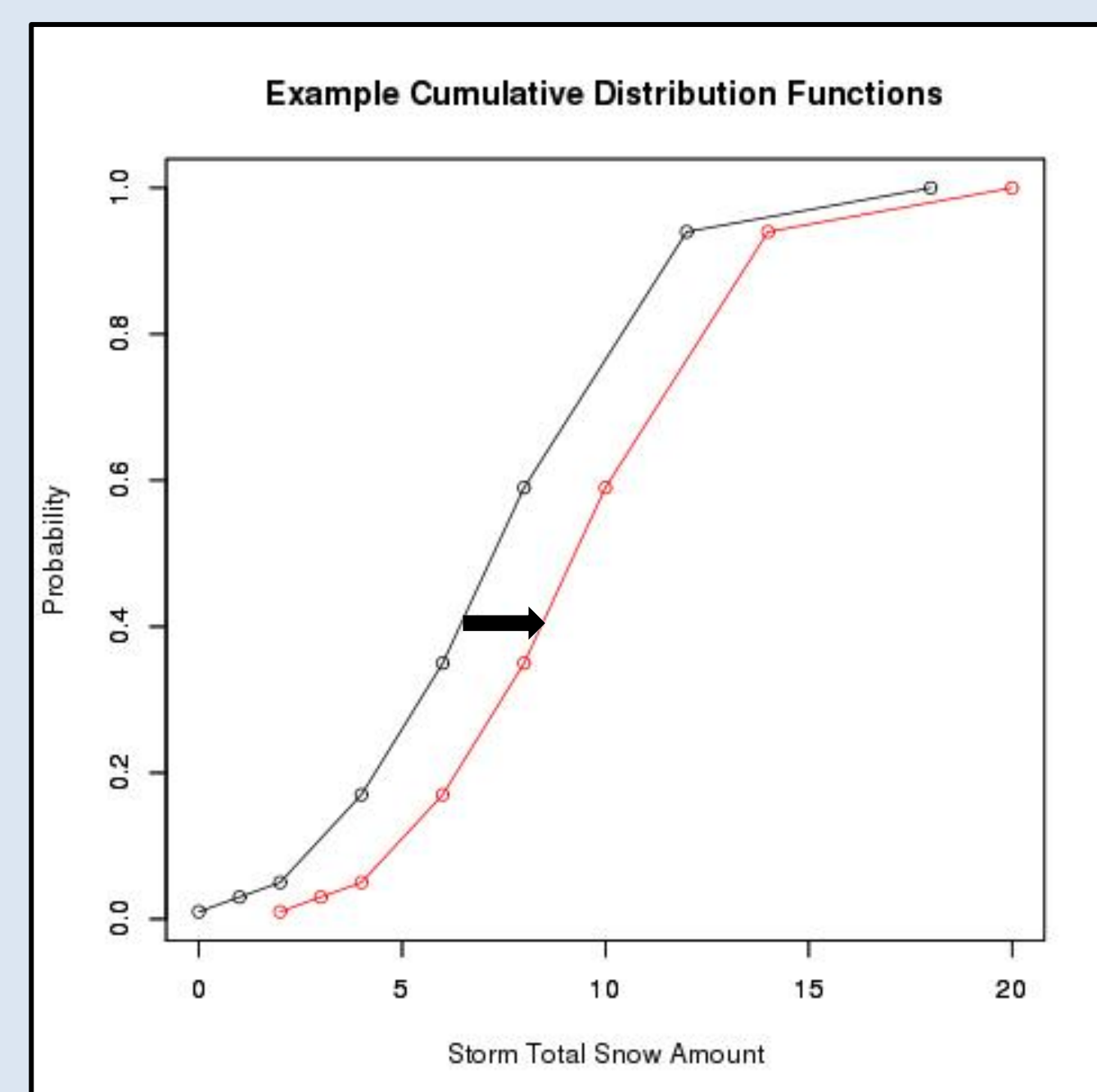
2. UNCERTAINTY INFORMATION FOR IDSS

Graphics of the min, most likely, and max snowfall totals are produced and used for IDSS messaging. Max and Min are from 10th and 90th percentiles, most likely is WFO's forecast.

Probable Min. Expected — 10th Percentile

Official NWS Forecast — Most Likely

Probable Max. Expected — 90th Percentile

Prob. ≥1"   Prob. ≥2"
Prob. ≥4"   Prob. ≥6"
Prob. ≥8"   Prob. ≥12"

Exceedance probabilities are computed from the CDF. Graphics and tables are created and displayed on the web.

Chance of Snow Accumulation
Experimental - Leave feedback
02/21/2015 0700PM to 02/22/2015 0700PM
What's this?

For cities in Prince George's, MD county
County: Prince George's, MD

Location	Min	Likely	Max	>=0.1"	>=1"	>=2"	>=4"	>=6"	>=8"	>=12"	>=18"
Camp Springs, MD	0	1	1	79%	52%	22%	0%	0%	0%	0%	0%
Accokeek, MD	0	1	3	74%	52%	22%	0%	0%	0%	0%	0%
Baden, MD	0	1	2	71%	39%	10%	0%	0%	0%	0%	0%
Bowie, MD	0	2	3	85%	60%	35%	0%	0%	0%	0%	0%
College Park, MD	0	2	3	87%	65%	42%	3%	0%	0%	0%	0%
Greenbelt, MD	0	2	3	87%	63%	39%	3%	0%	0%	0%	0%
Oxon Hill, MD	0	1	3	84%	57%	30%	0%	0%	0%	0%	0%
Upper Marlboro, MD	0	2	3	73%	49%	17%	0%	0%	0%	0%	0%

Switch to Range

Webpage Example: http://www.weather.gov/lwx/winter

3. TRAINING

Forecaster Training:
1. Start Training Early
2. Have all forecasters understand definitions of the 10/90 grids…
   - Min (10%) *"expect at least this amount…"*
   - Max (90%) *"…but be prepared for up to this amount…"*
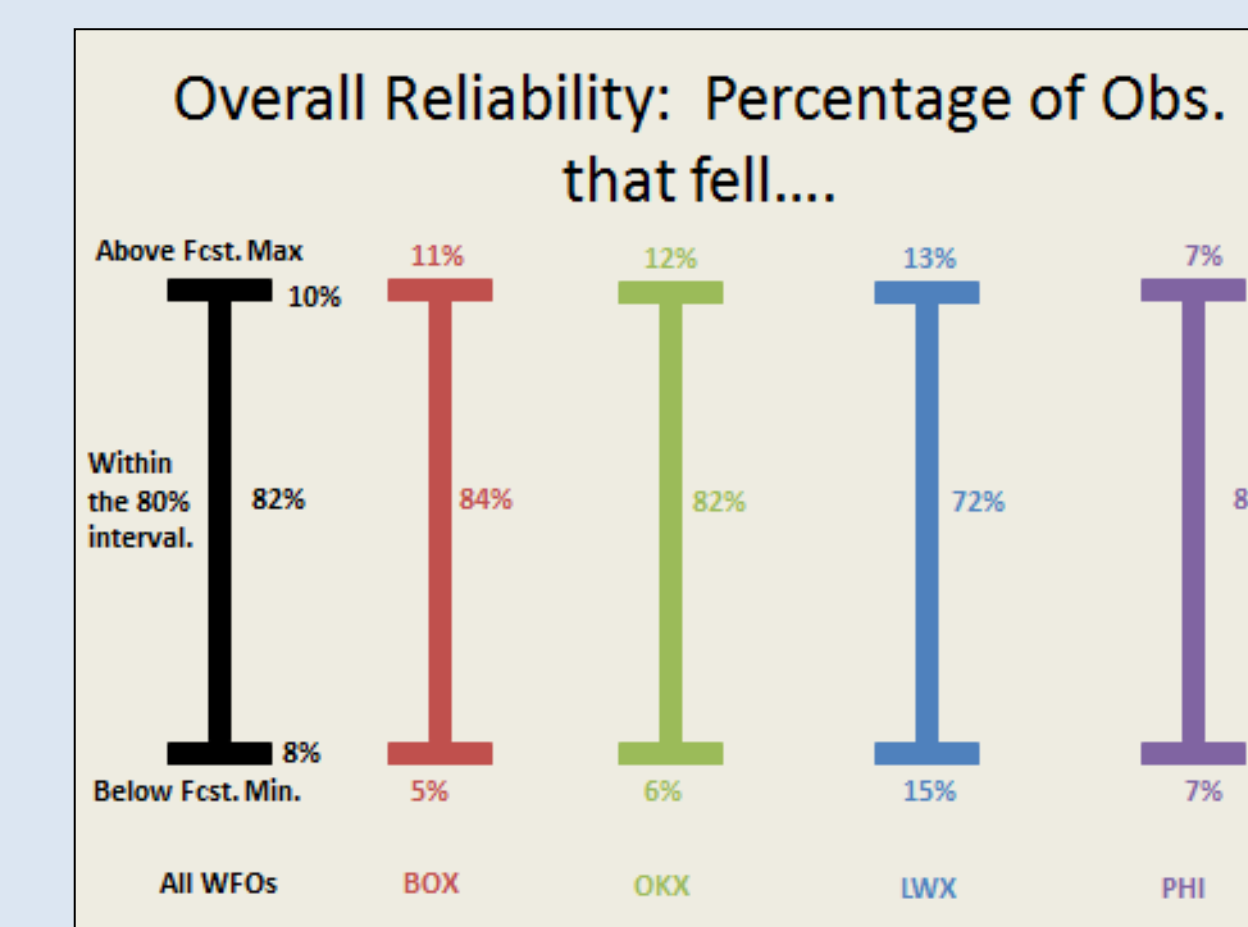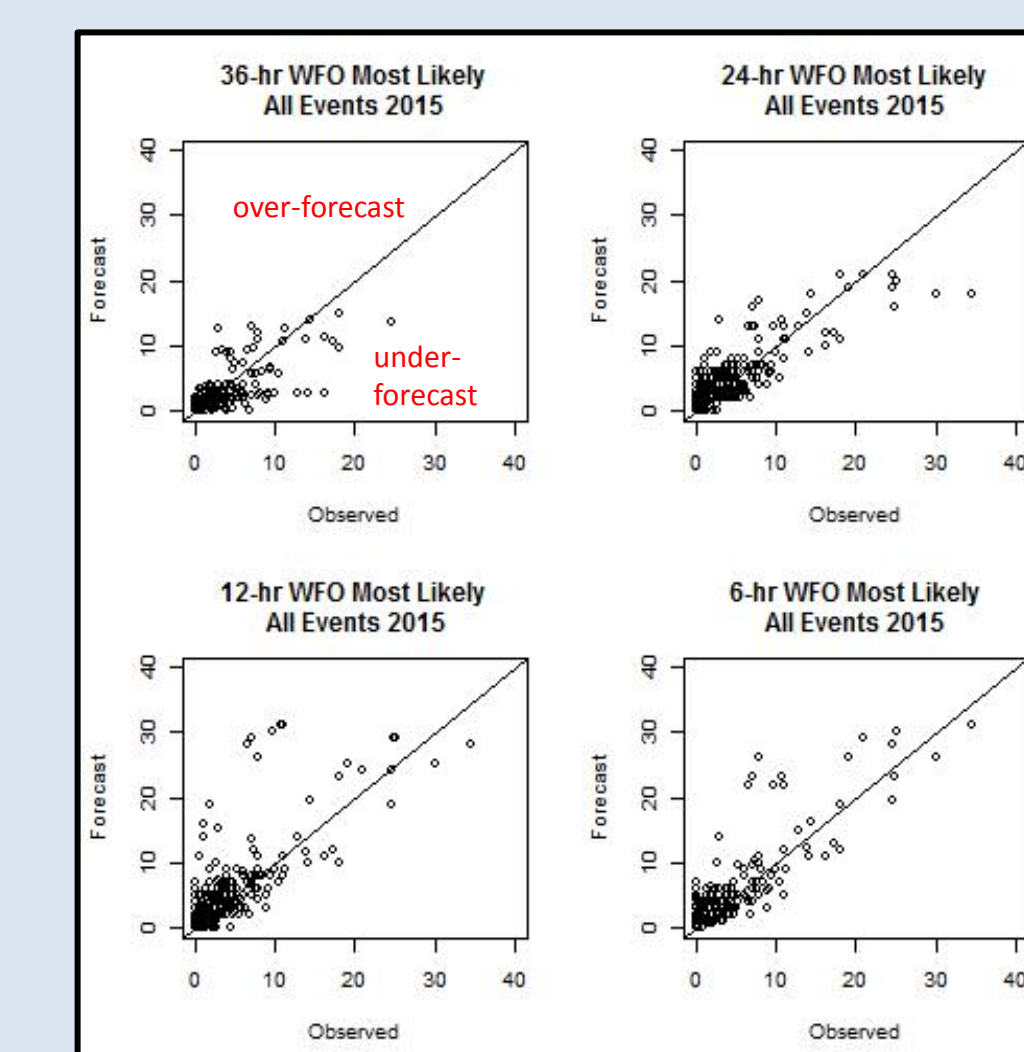   - Most Likely *"…our best forecast of what will happen…"*

Partners Outreach/Education:
- 3-pronged attack
  - Core partners (EMs, etc.)
  - DOTs
  - Broadcast & Electronic Media are our megaphones… …If they understand, then…
- Use webinars to lead them through page
  - Max/Min/Most Likely is most utilized

Partner YouTube Training Example: https://youtu.be/4XqiNUfCho4

4. 2014-2015 EXPERIMENTAL RESULTS

Feedback from emergency managers as well as the general public indicated that the probabilistic snowfall information was well received and appeared to be understood. Objective verification also showed the forecasts to be both accurate and statistically reliable over the winter season.

36-hr WFO Most Likely All Events 2015
over-forecast
under-forecast

24-hr WFO Most Likely All Events 2015

12-hr WFO Most Likely All Events 2015

6-hr WFO Most Likely All Events 2015

Overall Reliability: Percentage of Obs. that fell….

	All WFOs	BOX	OKX	LWX	PHI
Above Fcst. Max	10%	11%	12%	13%	7%
Within the 80% interval	82%	84%	82%	72%	86%
Below Fcst. Min	8%	5%	6%	15%	7%

5. CHANGES FOR WINTER 2015-2016

- **18 NWS WFOs participating**
  - Up from 4 WFOs in 2014-2015
  - Emphasize forecast collaboration with WPC
  - Social scientist involvement

- **Product Enhancements**
  - Probability of >=0.1" added
  - Color curve consistency

- **Increased objective verification**
  - Additional forecast-observed pairs
  - Automated verification for near-real time feedback
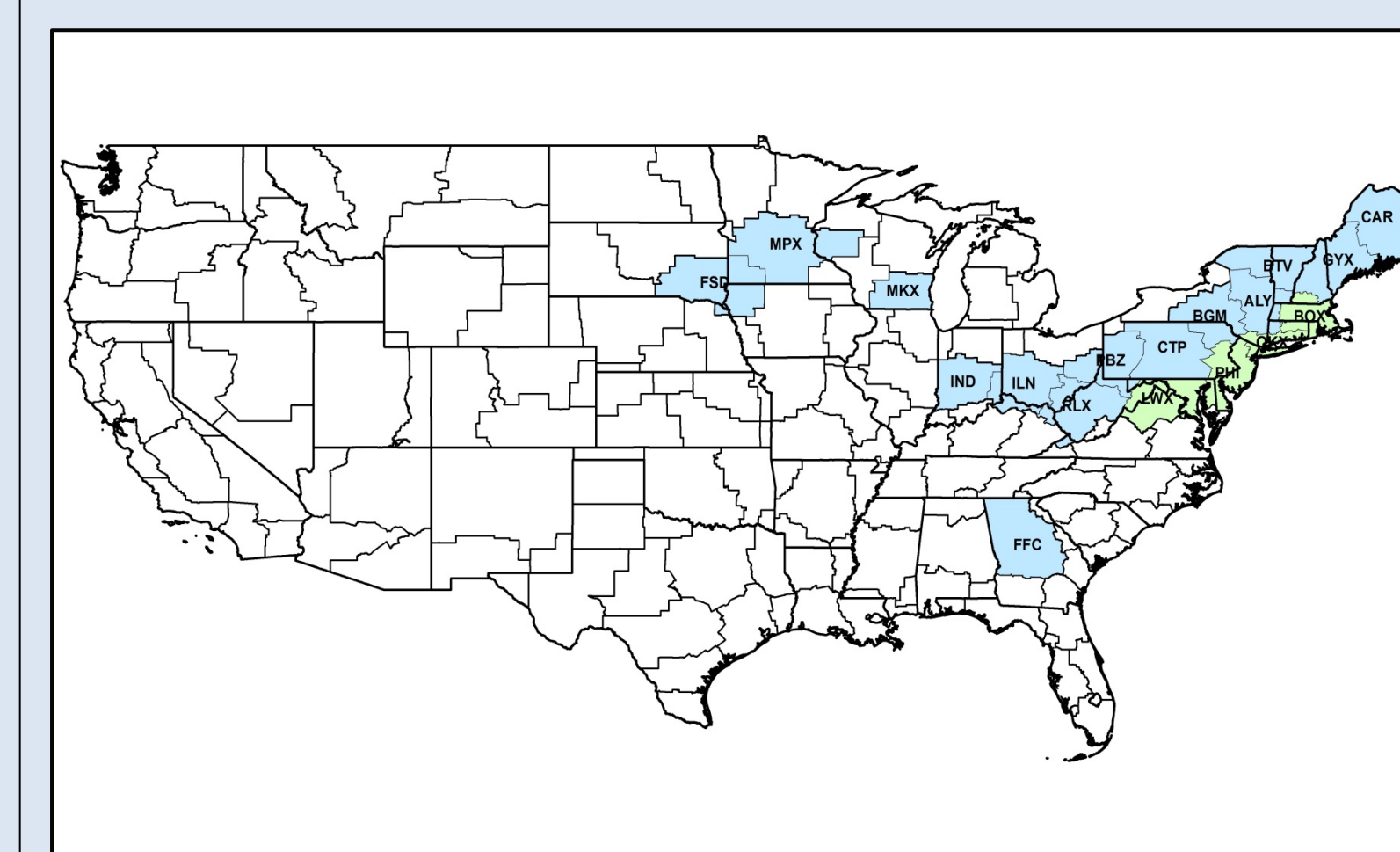
Four NWS WFOs were involved in the experiment in 2014-2015 (green) and 18 in 2015-2016 (both blue and green).

6. FUTURE DIRECTIONS

Ideally to reconstruct WPC's entire PDF/CDF the three binormal distribution shape parameters at each grid point would need to be sent to the WFO for use in GFE. Ultimately, the best approach would be to generate an adjusted CDF at WPC using the WFO STS as the mode in the calculation of the CDF.