Adding Intensity Information to SPC Outlooks

Utilizing conditional intensity to better quantify probabilistic threat by severe weather intensity

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Key Takeaways

Outlook Categories Unchanged

Frequency of outlook areas will be the same as prior years.

ENH in 2025 will be an ENH in 2026.

Added Intensity Information

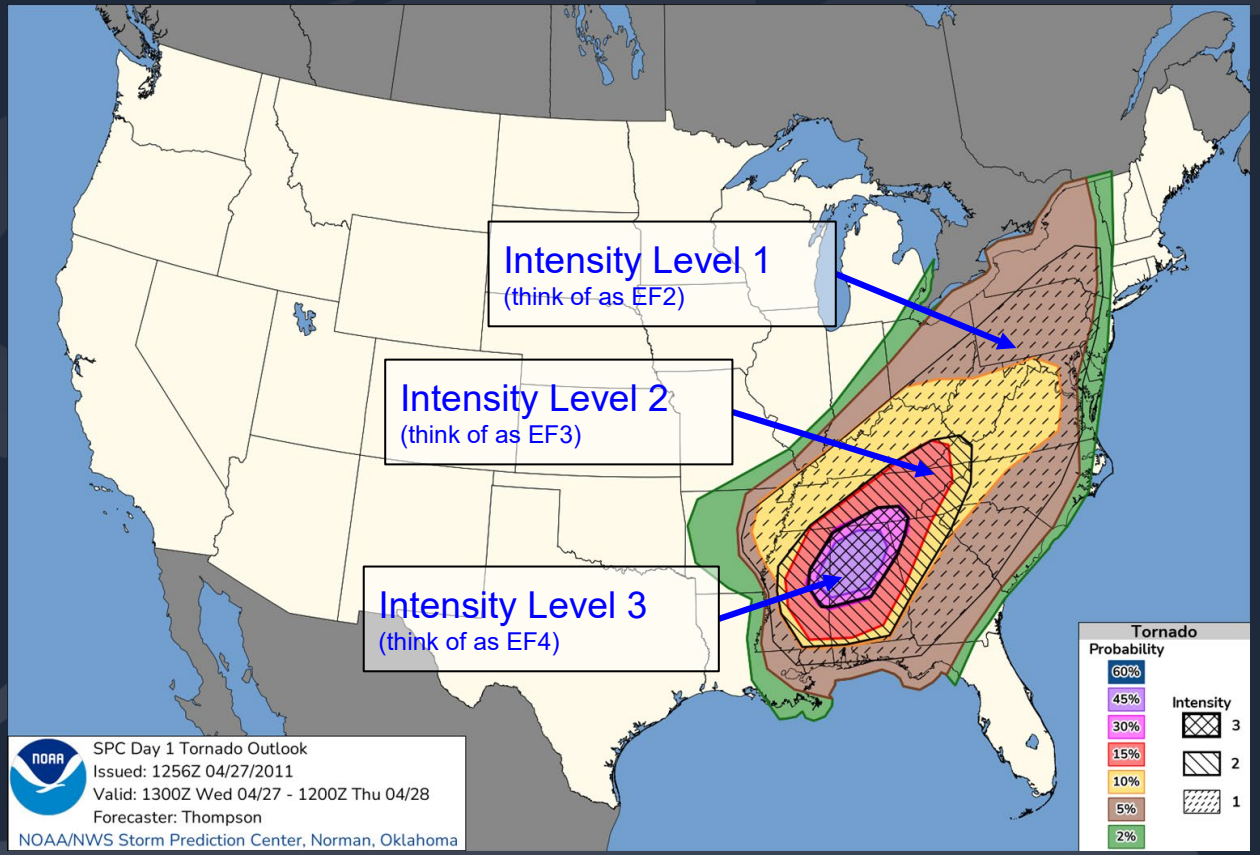
3 intensity categories for tornado and wind (2 for hail) to better reflect hazard intensities and potential impacts.

How this Helps You

Greater Intensity Potential (EF3+/3.5+” Hail/73+kt winds) now explicitly forecast within our outlooks

-No more trying to infer this information from our outlook text!

What if 27 April 2011 Looked Like This?

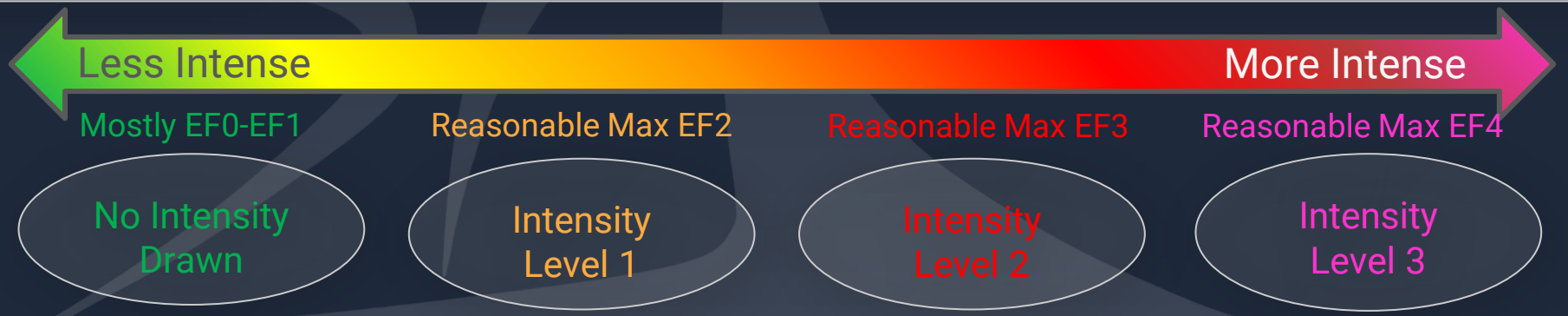


New: Conditional Intensities in SPC Outlooks

Key Change: You no longer need a 10% or greater probability area to highlight significant severe potential.

Methodology: Intensity forecasts are now based on storm environment and storm mode.

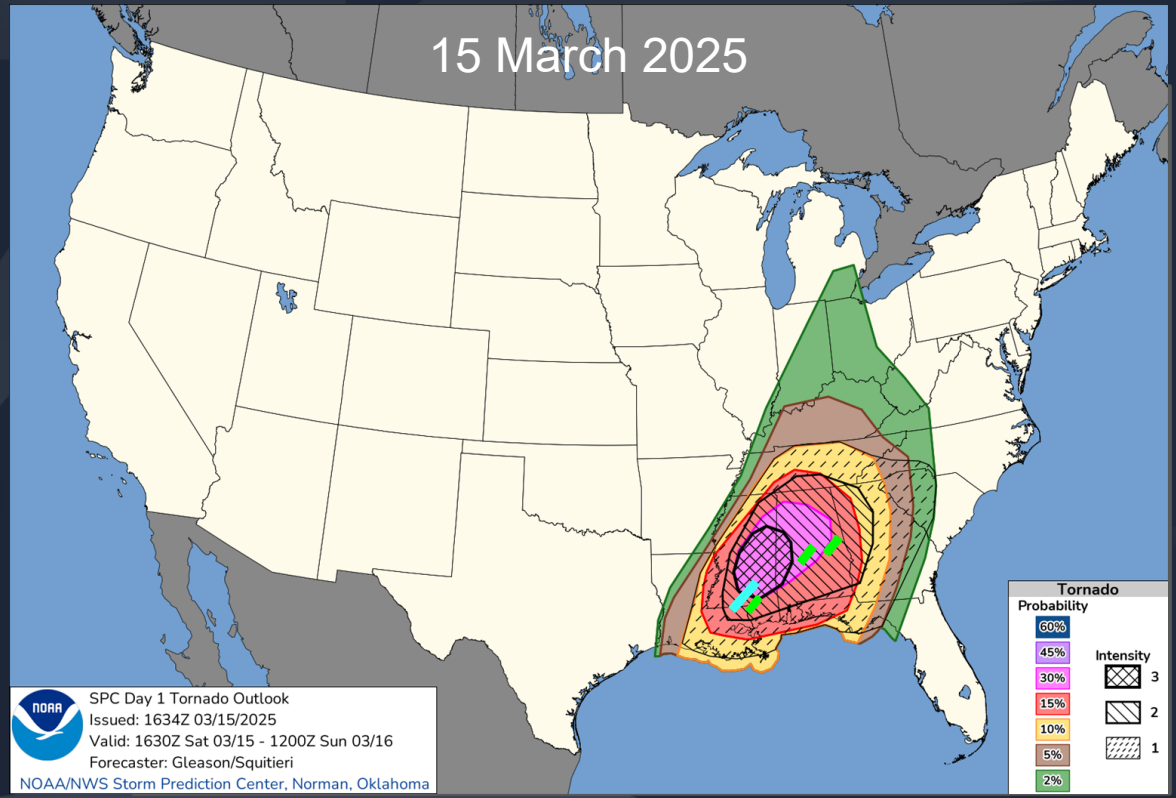
Definition: These intensities are conditional, meaning: "If a tornado occurs, what is the probability it will be EF2/EF3/EF4?"



6 Year Project

We have been doing this experimentally for over 6 years

- Since 2019 in the HWT
- SPC forecasters have been creating these conditional intensities internally since late 2021. (Available on SPC Internal Page)
- We have proven skill in the ability to discriminate the intensity levels



Why the Change?

Intensity

Current "Significant" Definition

Tornado:

EF2+

Wind: 65+ kts

Hail: 2"+

Intensity requires 10% coverage

Why this creates confusion

The "Binary" Problem

Current "SIG" treats EF2 and EF5 tornadoes the same.

Result: No detail provided about higher-end events.

The "Coverage" Problem

10% "SIG" tornado areas with an ENH categorical outlook incorrectly implies all tornadoes will be EF2+.

Mathematically blocked from sharing intensity information when coverage is <10%.

CIG = Intensity Level

Scientifically, these are Conditional Intensity Groups (CIG). However, simpler communication will be “Intensity Level”.

SPC Communication may occasionally use this terminology due to 4 years of its use and development with this terminology.

<CIG1 = No Intensity Highlights
CIG1 = Intensity Level 1
CIG2 = Intensity Level 2
CIG3 = Intensity Level 3

What Do We Really Mean by Conditional Tornado Intensity?

Forecast is a Reasonable Max Intensity Based on Environment and Storm Mode

More Simply Communicated

Intensity Level <1: Mostly EF0-EF1
Intensity Level 1 : Reasonable Max EF2
Intensity Level 2 : Reasonable Max EF3
Intensity Level 3 : Reasonable Max EF4

What Do We Really Mean by Conditional Damaging Wind Intensity?

Forecast is a Reasonable Max Intensity Based on Environment and Storm Mode

More Simply Communicated

No Intensity Highlighted: Mostly <64 kt winds
Intensity Level 1 : All storm modes, peak gusts 65+ knot
Intensity Level 2 : Bow echo and derecho possible
Intensity Level 3 : High-end derecho (usually ongoing)

What Do We Really Mean by Conditional Hail Intensity?

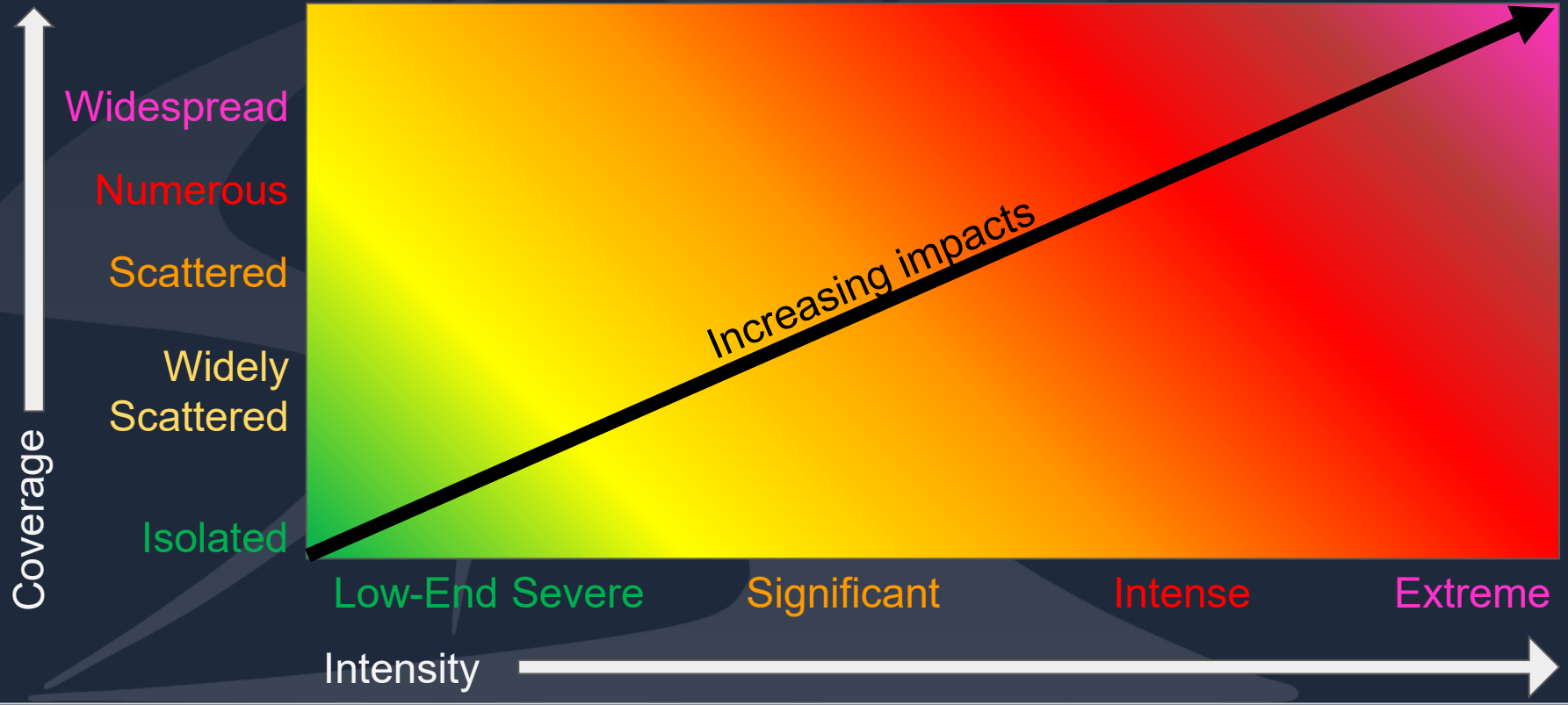
Forecast is a Reasonable Max Intensity Based on Environment and Storm Mode

More Simply Communicated

No Intensity Highlighted: Mostly <2” hail (quarter to golf ball)
Intensity Level 1 : 2.0” – 3.5” hail (tennis ball to baseball)
Intensity Level 2 : >3.5” hail (softball and larger)

SPC Conditional Intensity Outlooks

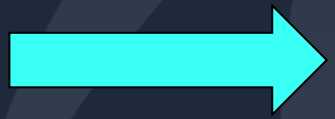
Tornado



SPC Tornado Outlook Combinations

Late 2014-2025

	No Sig	SIG
60%	5 HIGH	5 HIGH
45%	5 HIGH	5 HIGH
30%	4 MDT	5 HIGH
15%	3 ENH	4 MDT
10%	3 ENH	3 ENH
5%	2 SLGT	not used
2%	1 MRGL	not used



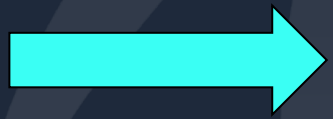
Starting in 2026

	<CIG1	CIG1	CIG2	CIG3
60%	3 ENH	5 HIGH	5 HIGH	5 HIGH
45%	3 ENH	4 MDT	5 HIGH	5 HIGH
30%	3 ENH	4 MDT	5 HIGH	5 HIGH
15%	3 ENH	3 ENH	4 MDT	4 MDT
10%	2 SLGT	3 ENH	3 ENH	3 ENH
5%	2 SLGT	2 SLGT	3 ENH	not used
2%	1 MRGL	1 MRGL	2 SLGT	not used

SPC Wind Outlook Combinations

Late 2014-2025

	No Sig	SIG
60%	4 MDT	5 HIGH
45%	3 ENH	4 MDT
30%	3 ENH	3 ENH
15%	2 SLGT	2 SLGT
5%	1 MRGL	not used



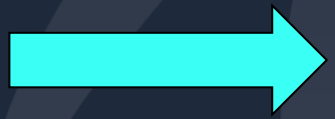
Starting in 2026

	<CIG1	CIG1	CIG2	CIG3
90%	3 ENH	4 MDT	5 HIGH	5 HIGH
75%	3 ENH	4 MDT	5 HIGH	5 HIGH
60%	3 ENH	4 MDT	5 HIGH	5 HIGH
45%	3 ENH	3 ENH	4 MDT	5 HIGH
30%	2 SLGT	3 ENH	3 ENH	not used
15%	2 SLGT	2 SLGT	3 ENH	not used
5%	1 MRGL	1 MRGL	2 SLGT	not used

SPC Hail Outlook Combinations

Late 2014-2025

	No Sig	SIG
60%	4 MDT	4 MDT
45%	3 ENH	4 MDT
30%	3 ENH	3 ENH
15%	2 SLGT	2 SLGT
5%	1 MRGL	not used



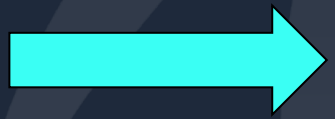
Starting in 2026

	<CIG1	CIG1	CIG2
60%	3 ENH	4 MDT	4 MDT
45%	3 ENH	3 ENH	4 MDT
30%	2 SLGT	3 ENH	3 ENH
15%	2 SLGT	2 SLGT	3 ENH
5%	1 MRGL	1 MRGL	2 SLGT

SPC Day 3 Outlook Combinations

Late 2014-2025

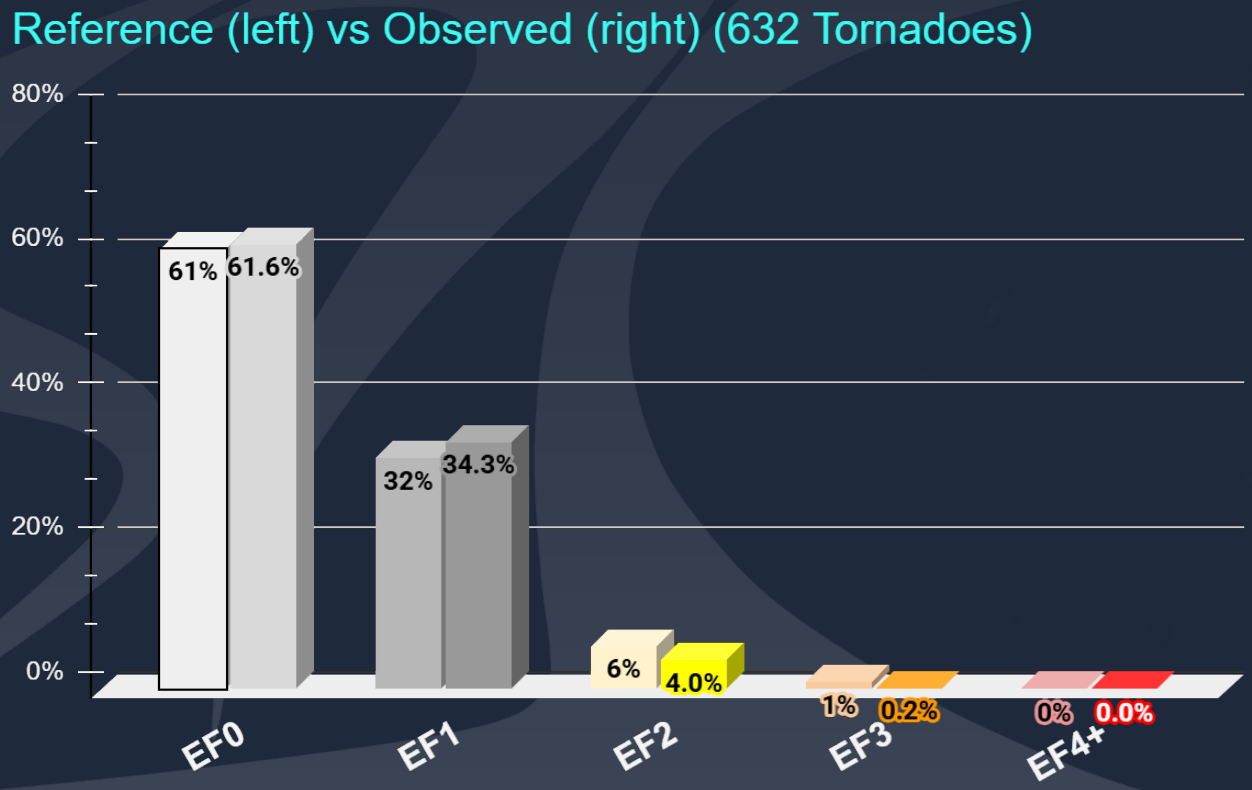
45% + SIG	4 MDT
45%	3 ENH
30% + SIG	3 ENH
30%	3 ENH
15% + SIG	2 SLGT
15%	2 SLGT
5%	1 MRGL



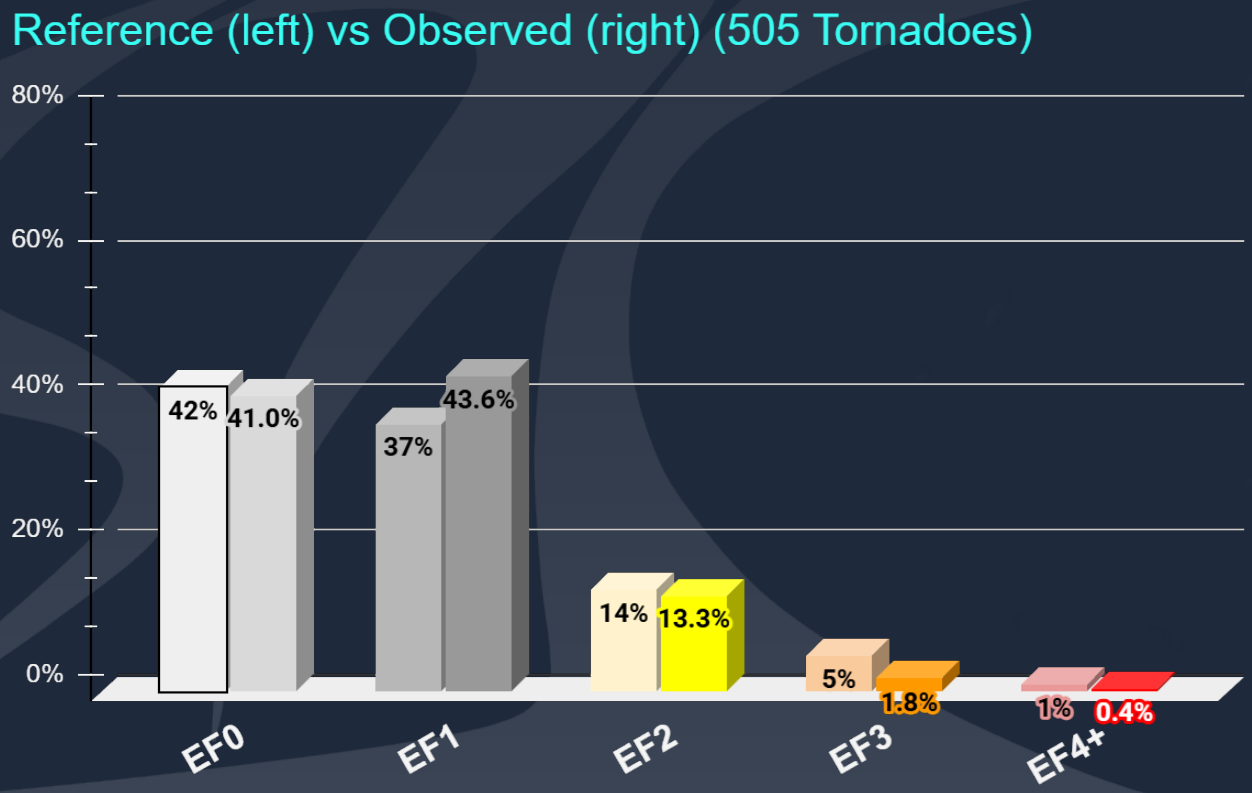
Starting in 2026

	<CIG1	CIG1	CIG2
60%	3 ENH	4 MDT	4 MDT
45%	3 ENH	3 ENH	4 MDT
30%	2 SLGT	3 ENH	3 ENH
15%	2 SLGT	2 SLGT	3 ENH
5%	1 MRGL	1 MRGL	2 SLGT

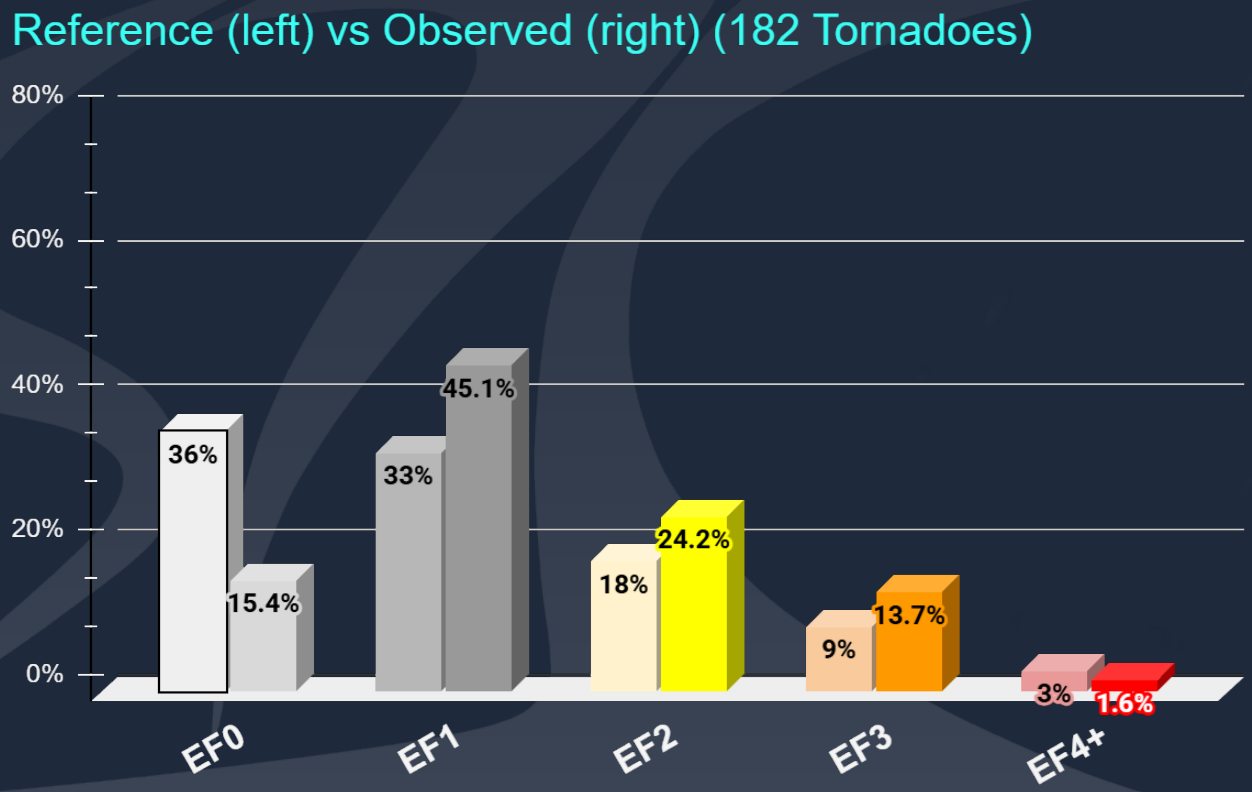
2025 Verification - No Intensity Area



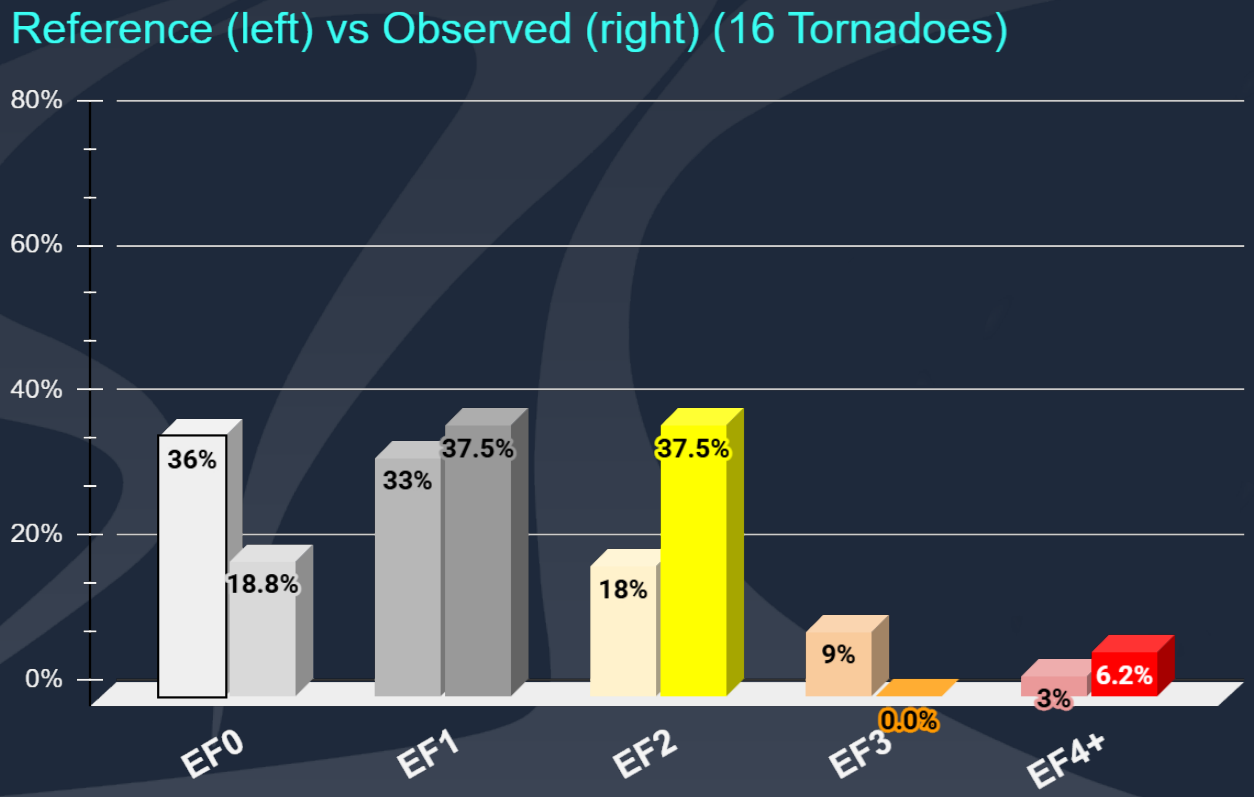
2025 Verification - CIG1



2025 Verification - CIG2



2025 Verification - CIG3

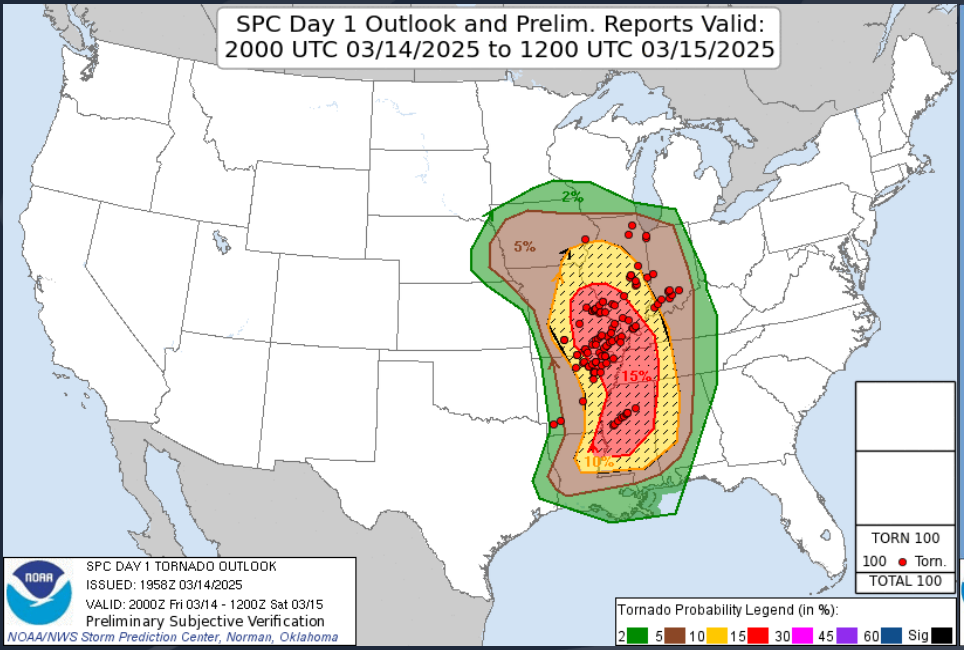


2025 Examples of Conditional Intensity Outlooks

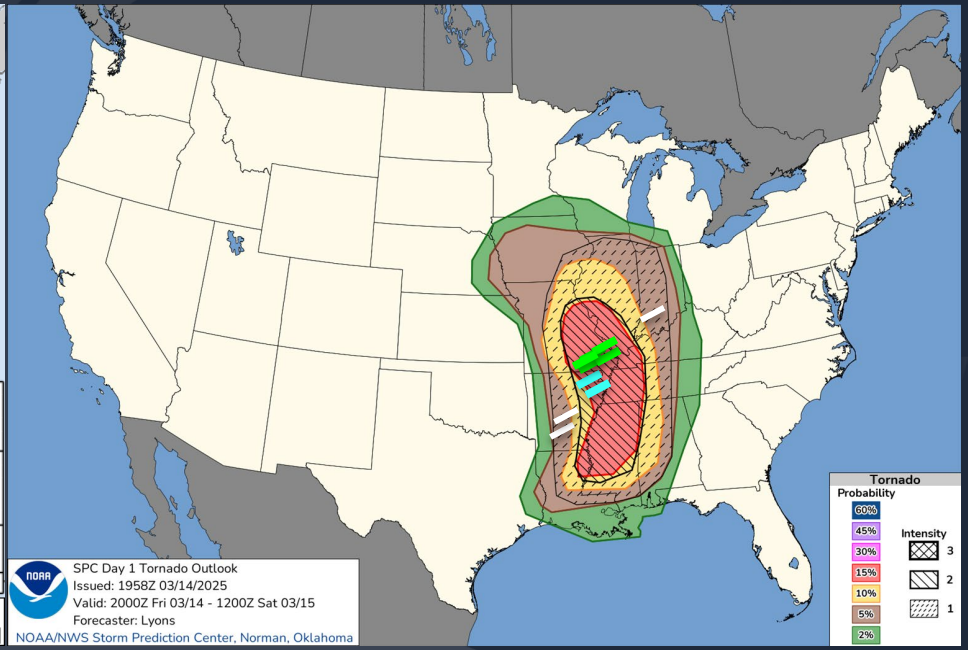
- On the left - SPC operational outlook
- On the right - Conditional Intensity forecasts produced in real time
- Reports during the forecast period are plotted on each graphic

14 March 2025 - Tornado Outlook

Operational



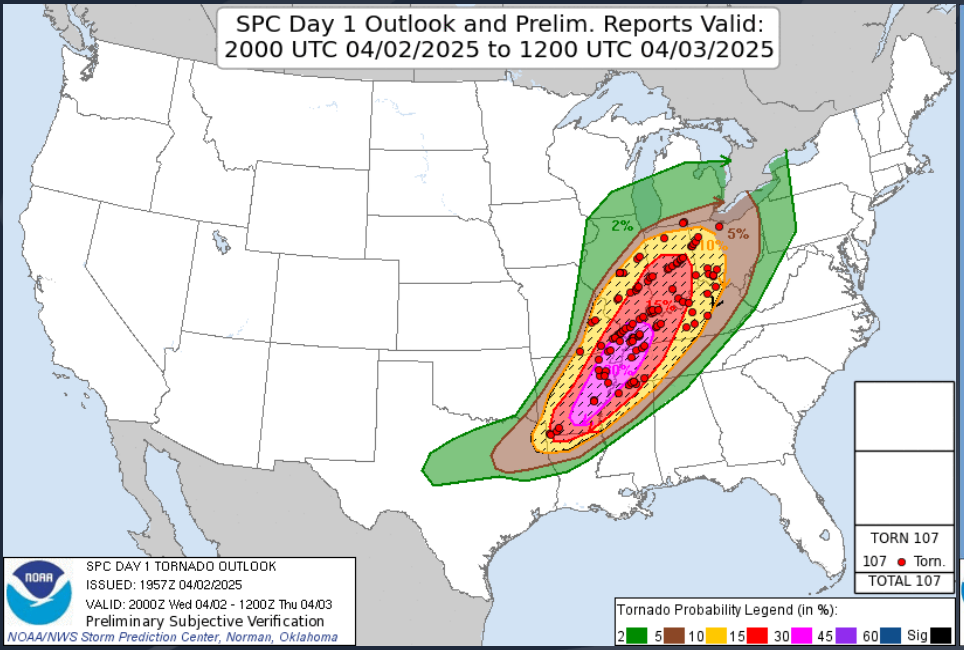
Conditional Intensity



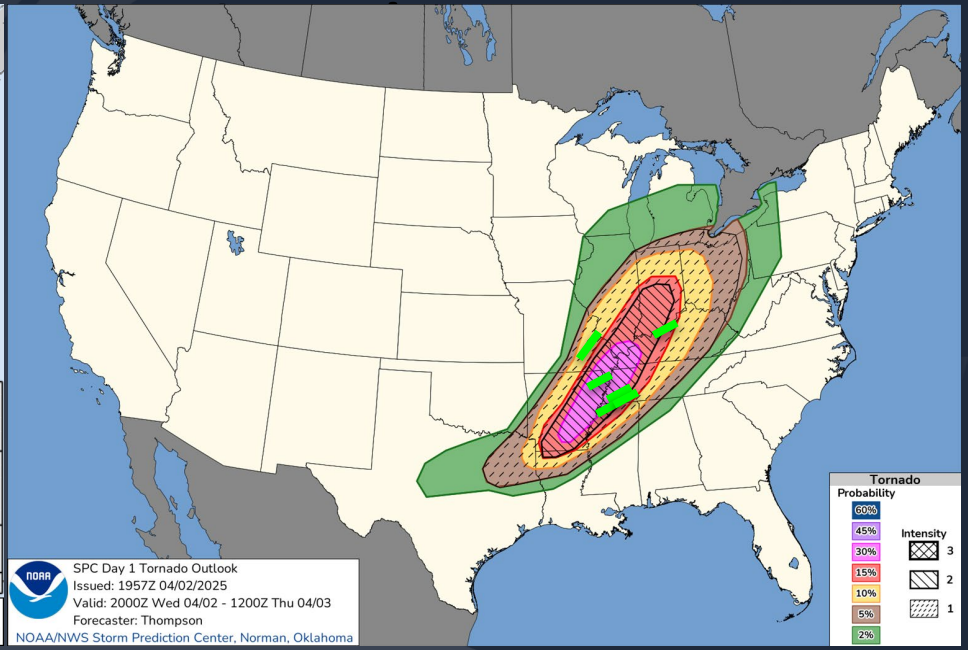
EF2 (In 5% or 2%) **EF3** **EF4+**

2 April 2025 - Tornado Outlook

Operational



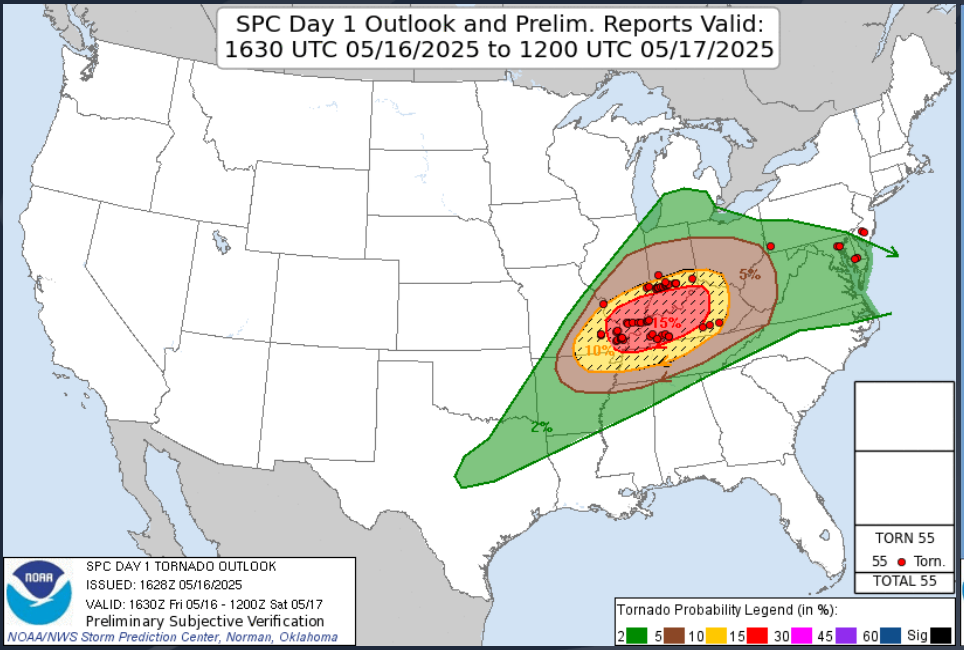
Conditional



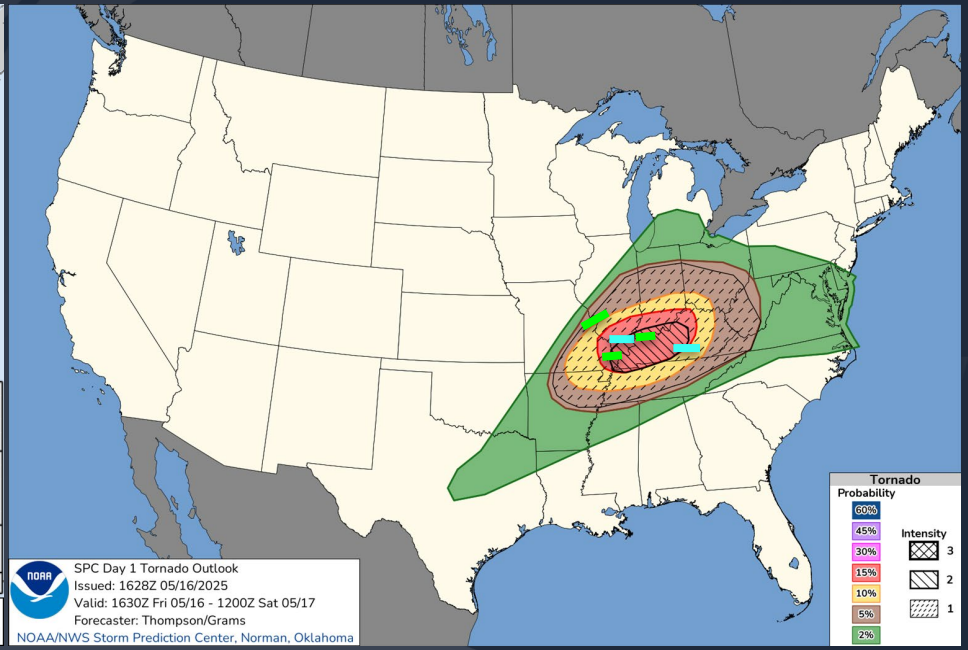
EF2 (In 5% or 2%) **EF3** **EF4+**

16 May 2025 - Tornado Outlook

Operational



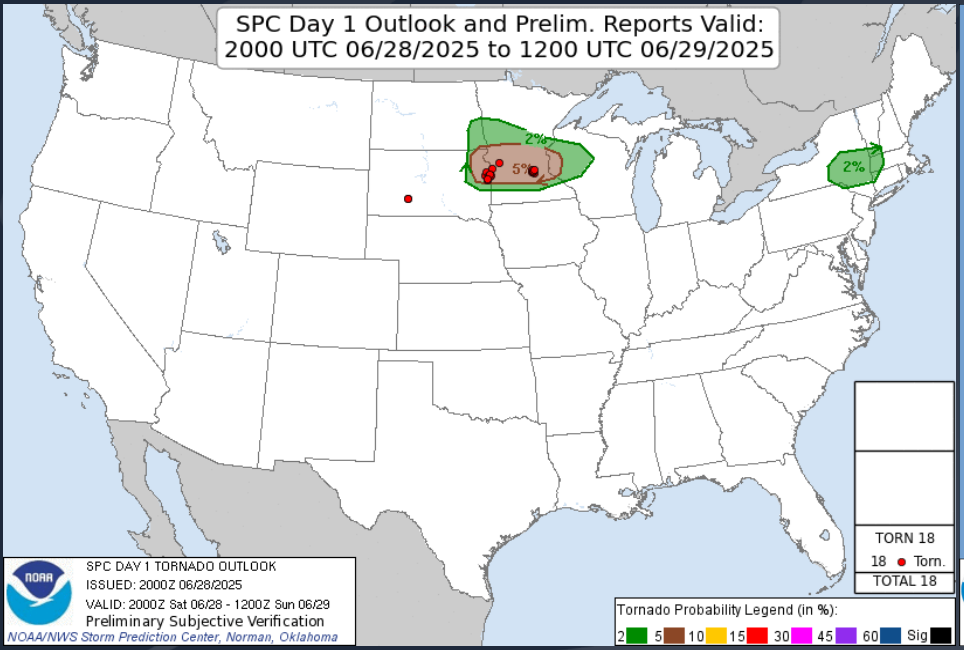
Conditional Intensity



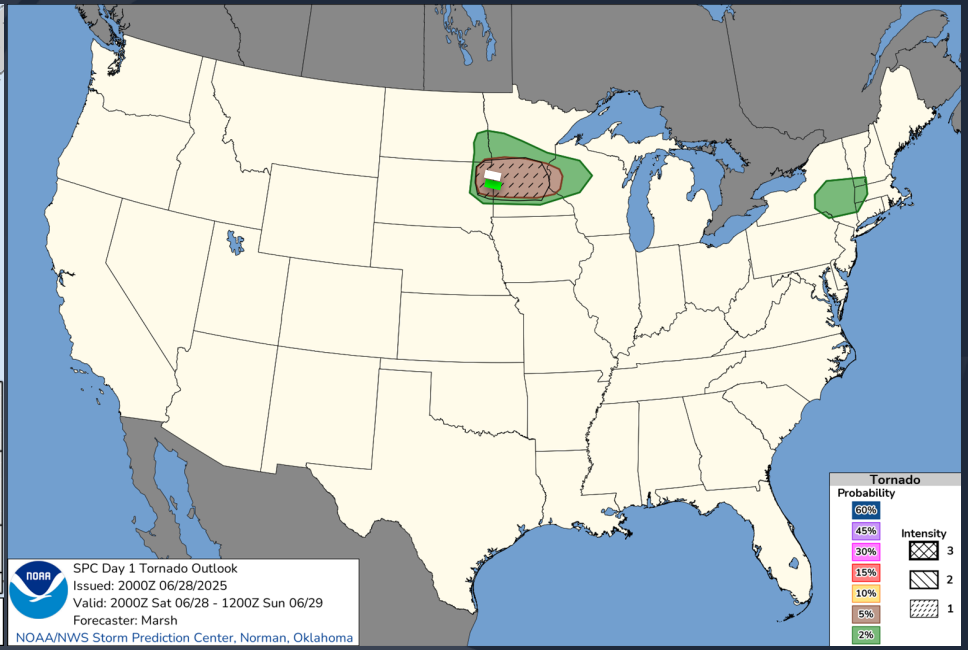
EF2 (In 5% or 2%) **EF3** **EF4+**

28 June 2025 - Tornado Outlook

Operational



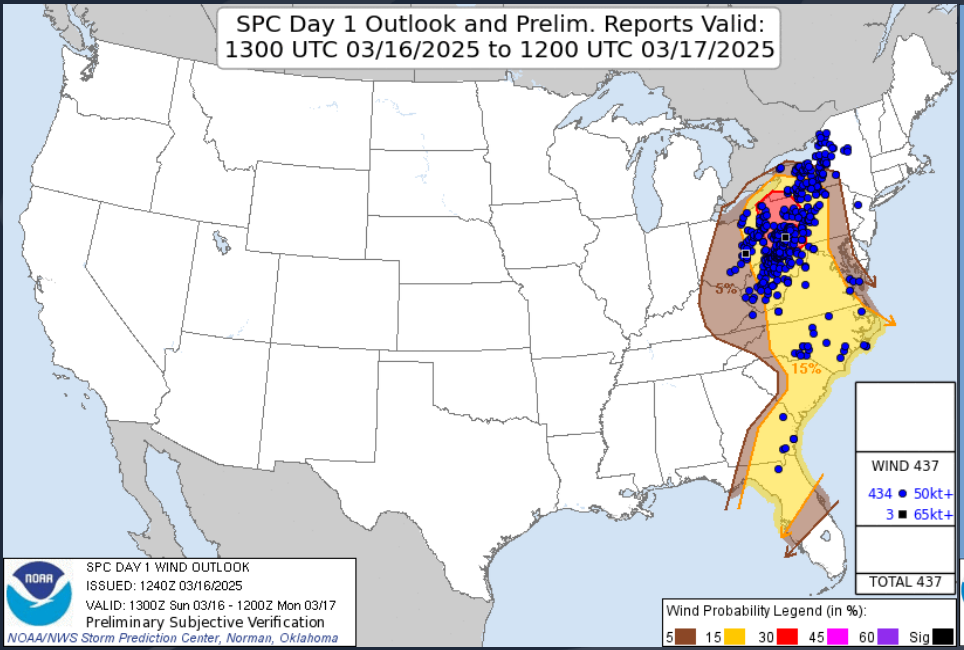
Conditional Intensity



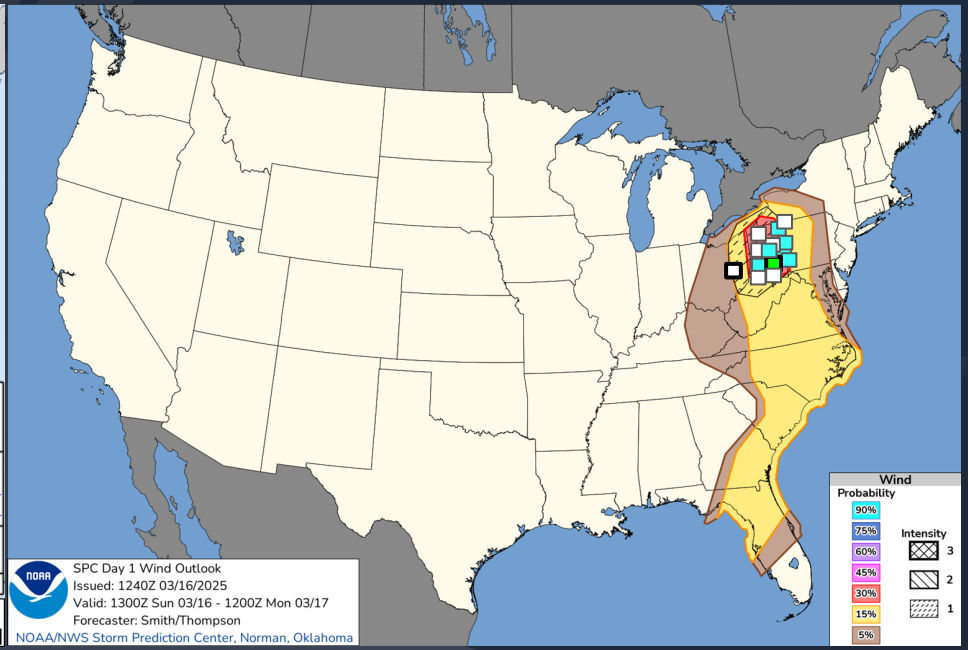
EF2 (In 5% or 2%) **EF3** **EF4+**

16 March 2025 - Wind Outlook

Operational



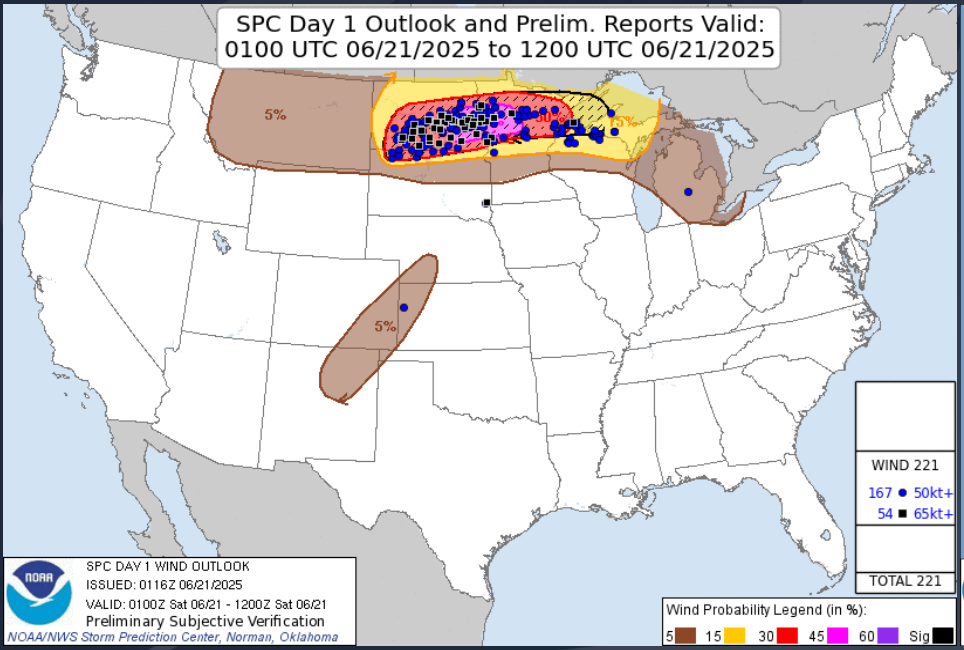
Conditional Intensity



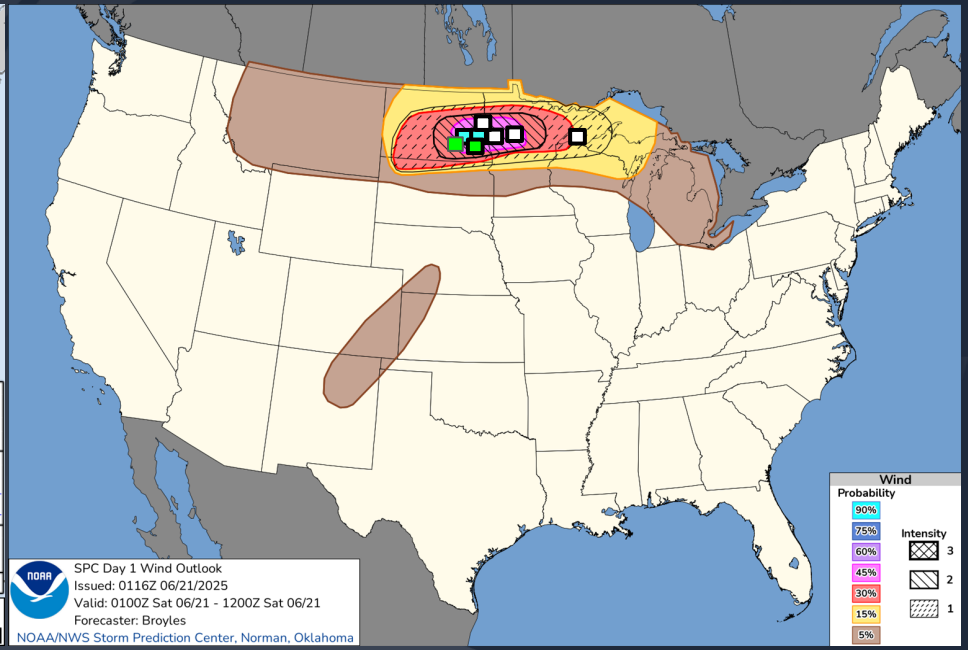
64 kts **73 kts** **82+ kts**

20 June 2025 - Wind Outlook

Operational



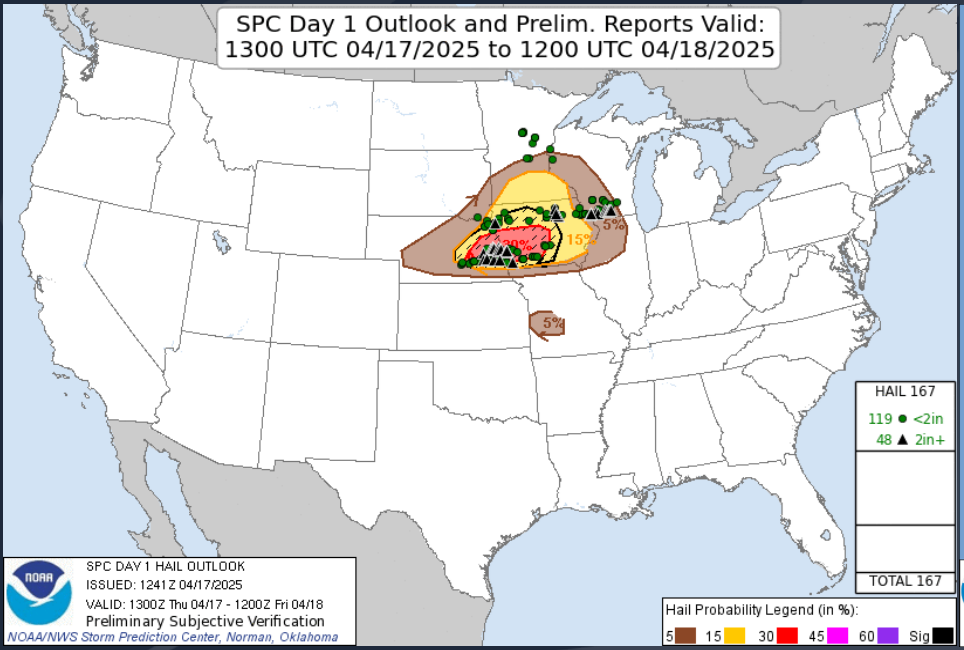
Conditional Intensity



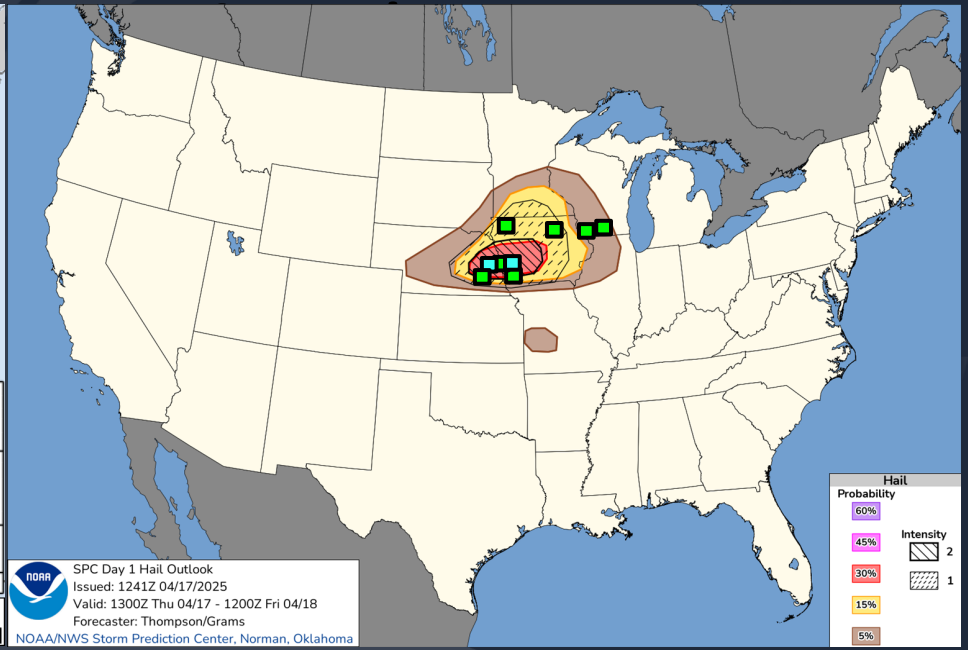
64 kts **73 kts** **82+ kts**

17 April 2025 - Hail Outlook

Operational



Conditional



2 inch **3.5+ inch**

Conditional Intensity Outlooks Summary

New Conditional Intensity Scheme not limited to 10% or greater coverage of unconditional probability areas:

Multiple Intensity Tiers

	TORNADO INTENSITY	WIND INTENSITY	HAIL INTENSITY
None Highlighted	Mostly EF-0 to EF-1	Mostly <74 mph winds	Mostly <2”
Intensity Level 1	Reasonable Max EF2	Peak gusts 74 mph+	Largest hail >2”
Intensity Level 2	Reasonable Max EF3	Bow Echo/Derecho possible	Largest hail >3.5”
Intensity Level 3	Reasonable Max EF4	High-end derecho	

Driven by Storm Environment and Convective Mode

Intensity Level 2+ tornado only in high-end environments with supercells

Intensity Level 2+ wind only with an organized MCS

Intensity Level 2+ hail only with supercells

New Probability-To-Category Conversion Charts

TORNADO (days 1-2) Total SEVERE (day 3)					WIND (days 1-2)					HAIL (days 1-2)				
					90%	3 ENH	4 MDT	5 HIGH	5 HIGH					
					75%	3 ENH	4 MDT	5 HIGH	5 HIGH					
60%	3 ENH	5 HIGH	5 HIGH	5 HIGH	60%	3 ENH	4 MDT	5 HIGH	5 HIGH	60%	3 ENH	4 MDT	4 MDT	60%	3 ENH	4 MDT	4 MDT
45%	3 ENH	4 MDT	5 HIGH	5 HIGH	45%	3 ENH	3 ENH	4 MDT	5 HIGH	45%	3 ENH	3 ENH	4 MDT	45%	3 ENH	3 ENH	4 MDT
30%	3 ENH	4 MDT	5 HIGH	5 HIGH	30%	2 SLGT	3 ENH	3 ENH	not used	30%	2 SLGT	3 ENH	3 ENH	30%	2 SLGT	3 ENH	3 ENH
15%	3 ENH	3 ENH	4 MDT	4 MDT	15%	2 SLGT	2 SLGT	3 ENH	not used	15%	2 SLGT	2 SLGT	3 ENH	15%	2 SLGT	2 SLGT	3 ENH
10%	2 SLGT	3 ENH	3 ENH	3 ENH	10%	not used	not used	not used	not used	10%	not used	not used	not used	10%	not used	not used	not used
5%	2 SLGT	2 SLGT	3 ENH	not used	5%	1 MRGL	1 MRGL	2 SLGT	not used	5%	1 MRGL	1 MRGL	2 SLGT	5%	1 MRGL	1 MRGL	2 SLGT
2%	1 MRGL	1 MRGL	2 SLGT	not used	2%	not used	not used	not used	not used	2%	not used	not used	not used	2%	not used	not used	not used
	<CIG1	CIG1	CIG2	CIG3		<CIG1	CIG1	CIG2	CIG3		<CIG1	CIG1	CIG2		<CIG1	CIG1	CIG2

Any Questions?

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