

# **2025 AIR QUALITY FORECAST ACCURACY FOR NORTHEAST OHIO**

**Air Quality Subcommittee**

**December 19, 2025**

# **ACTION REQUESTED**

**No action requested. This item is for information and presentation.**

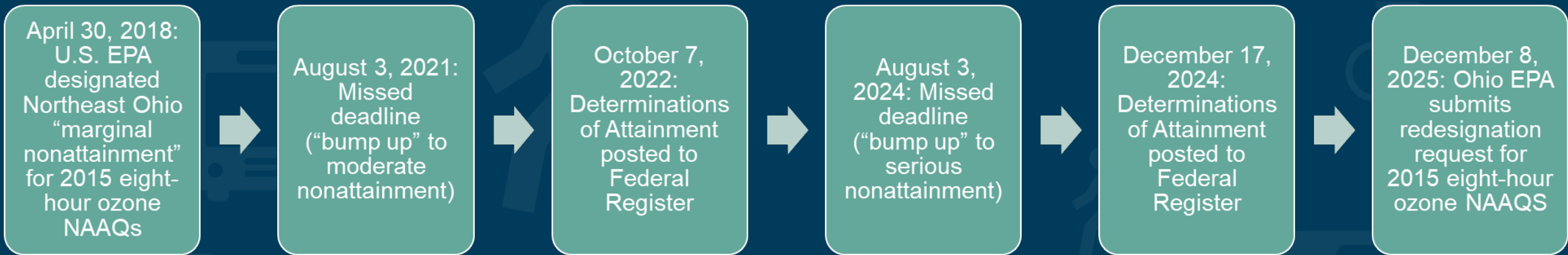
## **PREVIOUS ACTION**

**The Air Quality Subcommittee has received previous updates on this agenda item.**

# OVERVIEW

- NAAQS History
- Air Quality Monitors
- 2025 Model Performance ( $O_3$ )
- 2025 Model Performance ( $PM_{2.5}$ )
- Questions

# O<sub>3</sub> NAAQS TIMELINE



# PM<sub>2.5</sub> NAAQS TIMELINE

2012: U.S. EPA strengthens PM<sub>2.5</sub> annual standard from 15 µg/m<sup>3</sup> to 12 µg/m<sup>3</sup>

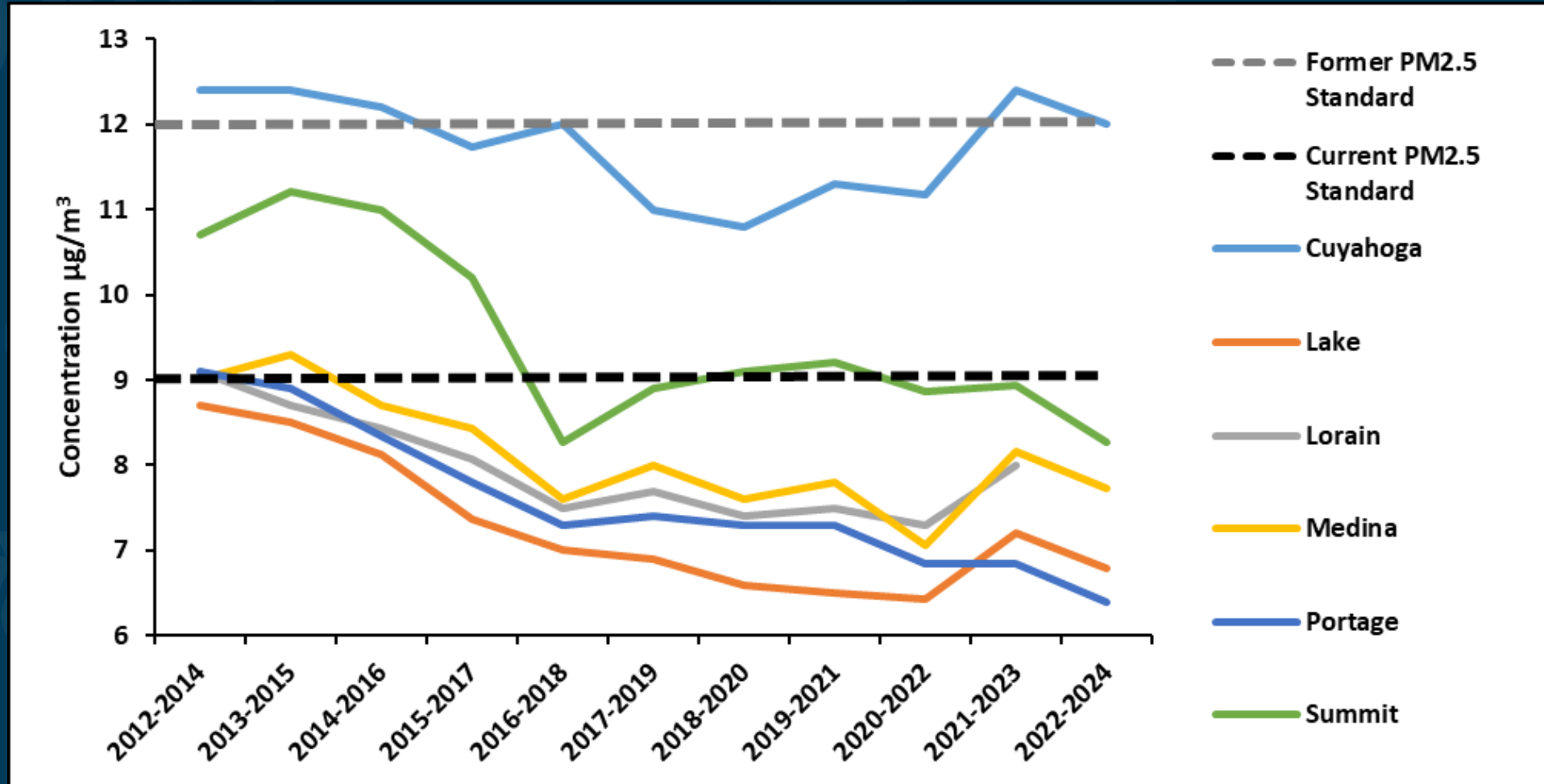
2024: U.S. EPA strengthens PM<sub>2.5</sub> primary annual standard from 12 µg/m<sup>3</sup> to 9 µg/m<sup>3</sup>

May 6, 2024: PM<sub>2.5</sub> primary annual standard takes effect. Cuyahoga County to exceed the standard

February 7, 2025: Ohio EPA recommends designating Cuyahoga County as “nonattainment”

February 6, 2026: Anticipated date for U.S. EPA final PM<sub>2.5</sub> nonattainment designations

# THREE-YEAR ROLLING AVERAGES FOR ANNUAL PM<sub>2.5</sub> IN NE OHIO COUNTIES






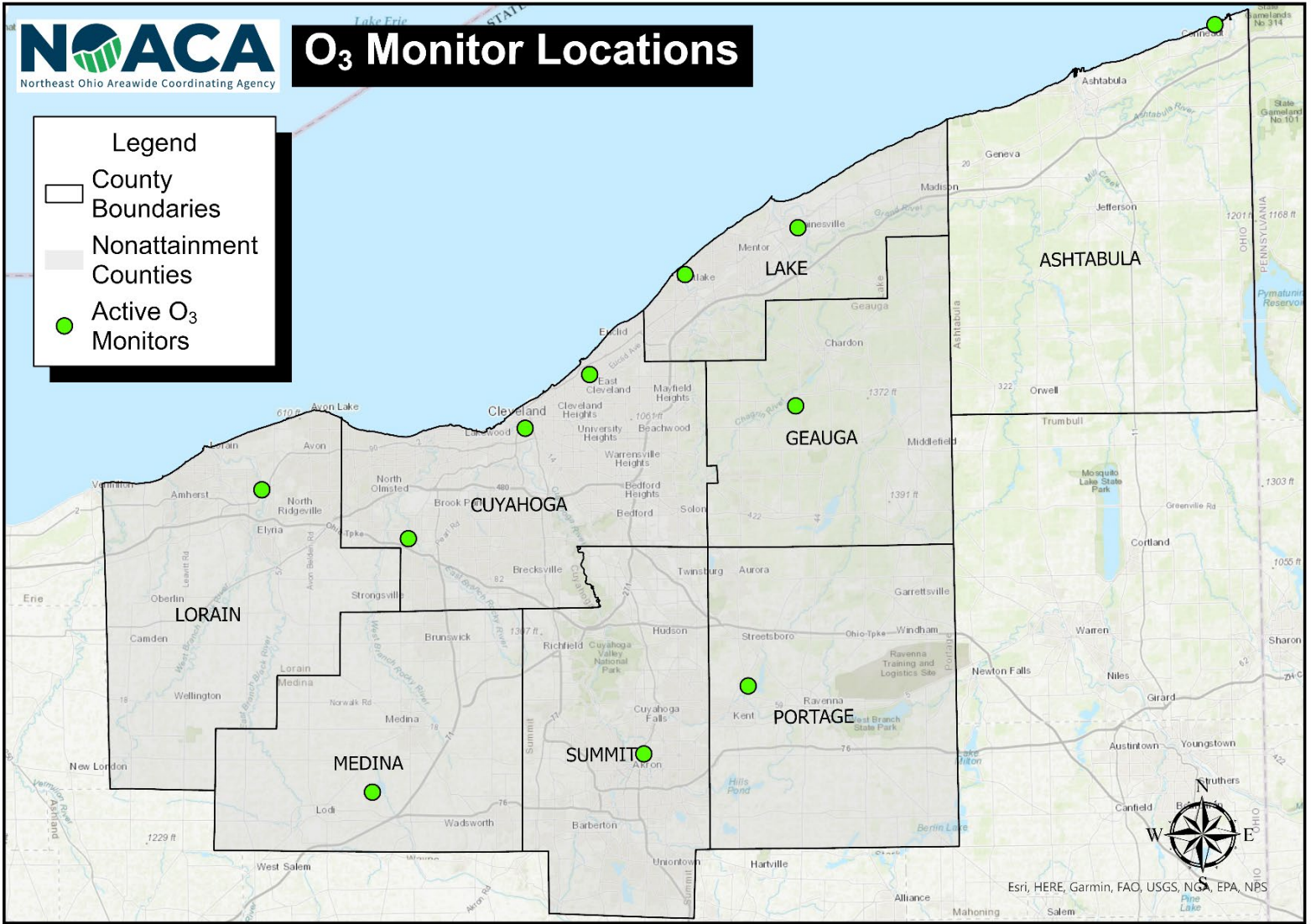
# AIR QUALITY MONITOR LOCATIONS IN NORTHEAST OHIO

- Ohio EPA monitors in Northeast Ohio
  - O<sub>3</sub>: 11 monitors
    - 12 monitors in 2024
    - Mayfield station deactivated by Ohio EPA
  - PM<sub>2.5</sub>: Nine (9) monitors
- Air Quality Monitoring Region includes:
  - NOACA counties (5): Cuyahoga, Geauga, Lake, Lorain, Medina
  - AMATS counties (2): Portage and Summit
  - Ashtabula County

# O<sub>3</sub> Monitor Locations

**Legend**



-  County Boundaries
-  Nonattainment Counties
-  Active O<sub>3</sub> Monitors

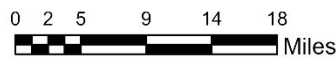
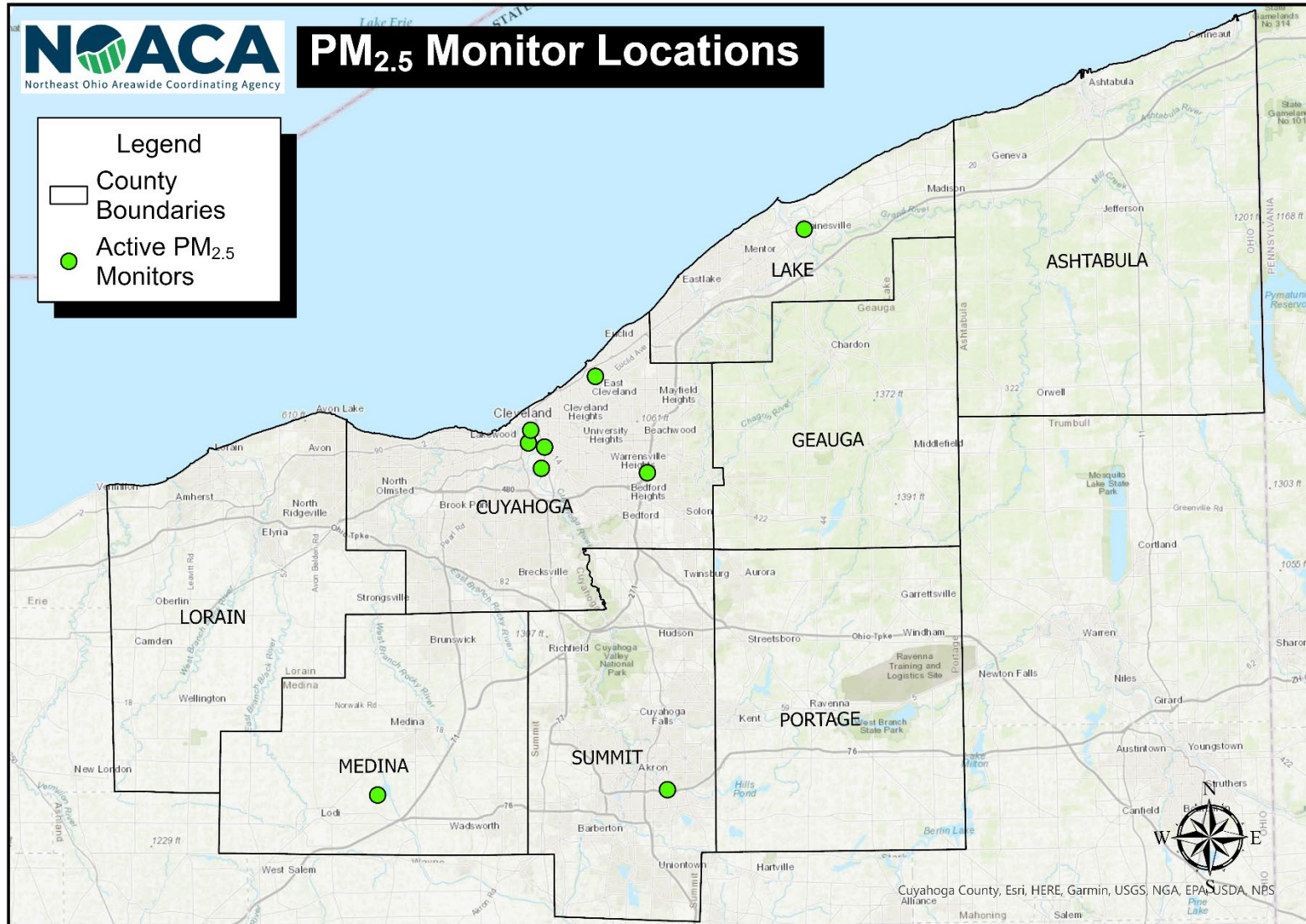


NOACA makes no representations or warranties with respect to accuracy and/or completeness of the map

# PM<sub>2.5</sub> Monitor Locations

**Legend**

-  County Boundaries
-  Active PM<sub>2.5</sub> Monitors



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# AIR QUALITY FORECASTS IN NORTHEAST OHIO

- NOACA forecasts daily peak fine particulate matter concentrations and eight-hour ground-level ozone concentrations.
  - Daily forecasts for fine particulate matter are year-round
  - In 2025, daily forecasts for ozone began March 1 and concluded October 31
- NOACA posts daily air quality forecasts through AirNowTech, in affiliation with US EPA.

# NOACA AND NOAA 2025 FORECAST PERFORMANCE: O<sub>3</sub>

Forecast		Threshold	
		50ppb	70ppb
Agency	NOACA	81%	94%
	NOAA 6Z (M/B)	(77/76)%	(96/95)%
	NOAA 12Z (M/B)	(80/76)%	(96/94)%

*M = Standard Model; B = Bias-Corrected Model*

# EXCEEDANCE DAYS FOR 2025 (O<sub>3</sub>)

DATE	FORECAST AQI		OBSERVED AQI	
	NOAA 6Z(M/B)/ 12Z(M/B)	NOACA	PEAK	# STATIONS
APRIL 24	1/2/2/2	2	3 (71)	3
JUNE 3	2/2/2/2	2	3 (75)	2
JUNE 12	2/2/2/2	2	3 (76)	2
JULY 15	3/2/3/2	2	3 (85)	11
JULY 23	2/2/2/2	3	3 (74)	1

AIR QUALITY INDEX	
CATEGORY	HEALTH CONCERN LEVEL
1	GOOD
2	MODERATE
3	UNHEALTHY FOR SENSITIVE GROUPS
4	UNHEALTHY
5	VERY UNHEALTHY
6	HAZARDOUS

*M = Standard Model; B = Bias-Corrected Model*

# NOAA VERSUS NOACA EXCEEDANCE FORECAST PERFORMANCE ( $O_3$ )

- “Missed Opportunities” – Four (4) days each NOACA and NOAA did not forecast observed categorical exceedance of 2015 eight-hour ozone standard (70 ppb). NOAA standard models forecasted July 15 exceedance, but NOAA bias-corrected models did not.
- “False Alarms” – Eight (8) days NOACA forecasted categorical exceedance of 2015 eight-hour standard (70 ppb) when observed concentrations did not exceed. NOAA 6Z standard model forecasted four (4) such days; NOAA 6Z bias-corrected model forecasted five (5) such days; NOAA 12Z standard model forecasted five (5) such days; and NOAA 12Z bias-corrected model forecasted seven (7) such days.

# EXCEEDANCE STATIONS

- 32 exceedance stations (events when either the NOAA forecast, the observation, or both exceeded the 2015 O<sub>3</sub> NAAQS at individual monitors).
- “Missed Opportunities” – **NOAA missed observed exceedance at a station 21 times (66%).**
- “False Alarms” – **NOAA falsely predicted exceedance at a station 11 times (34%)**
- “Success” – **NOAA truly predicted exceedance at a station zero times (0%)**

# EXCEEDANCE STATIONS

## Successful Predictions

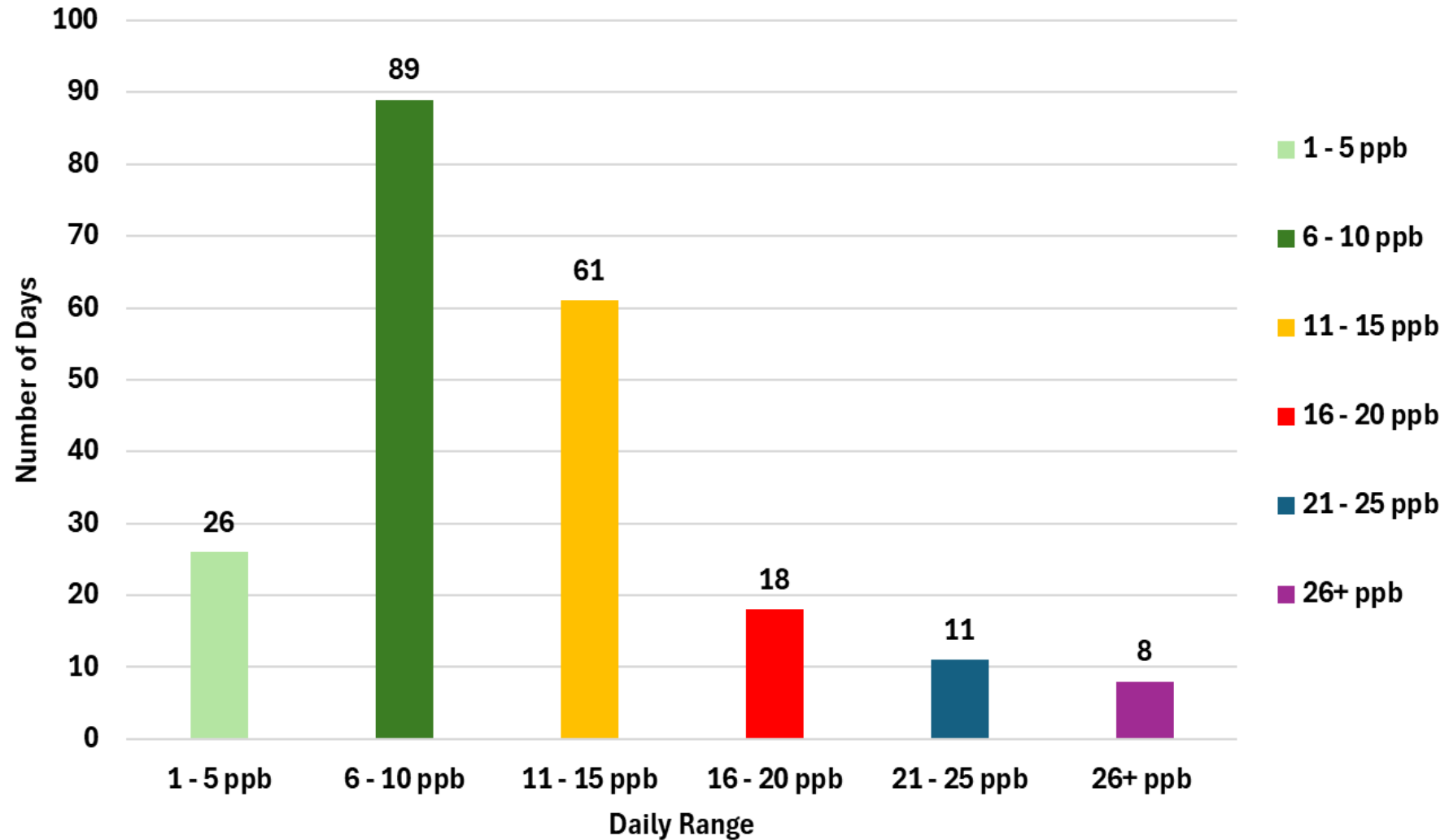
YEAR	SUCCESS	TOTAL	%
2020	5	39	12.8%
2021	2	20	10.0%
2022	4	37	10.8%
2023	11	65	16.9%
2024	2	39	5.1%
2025*	0	32	0.0%

*\*Mayfield Station no longer active*

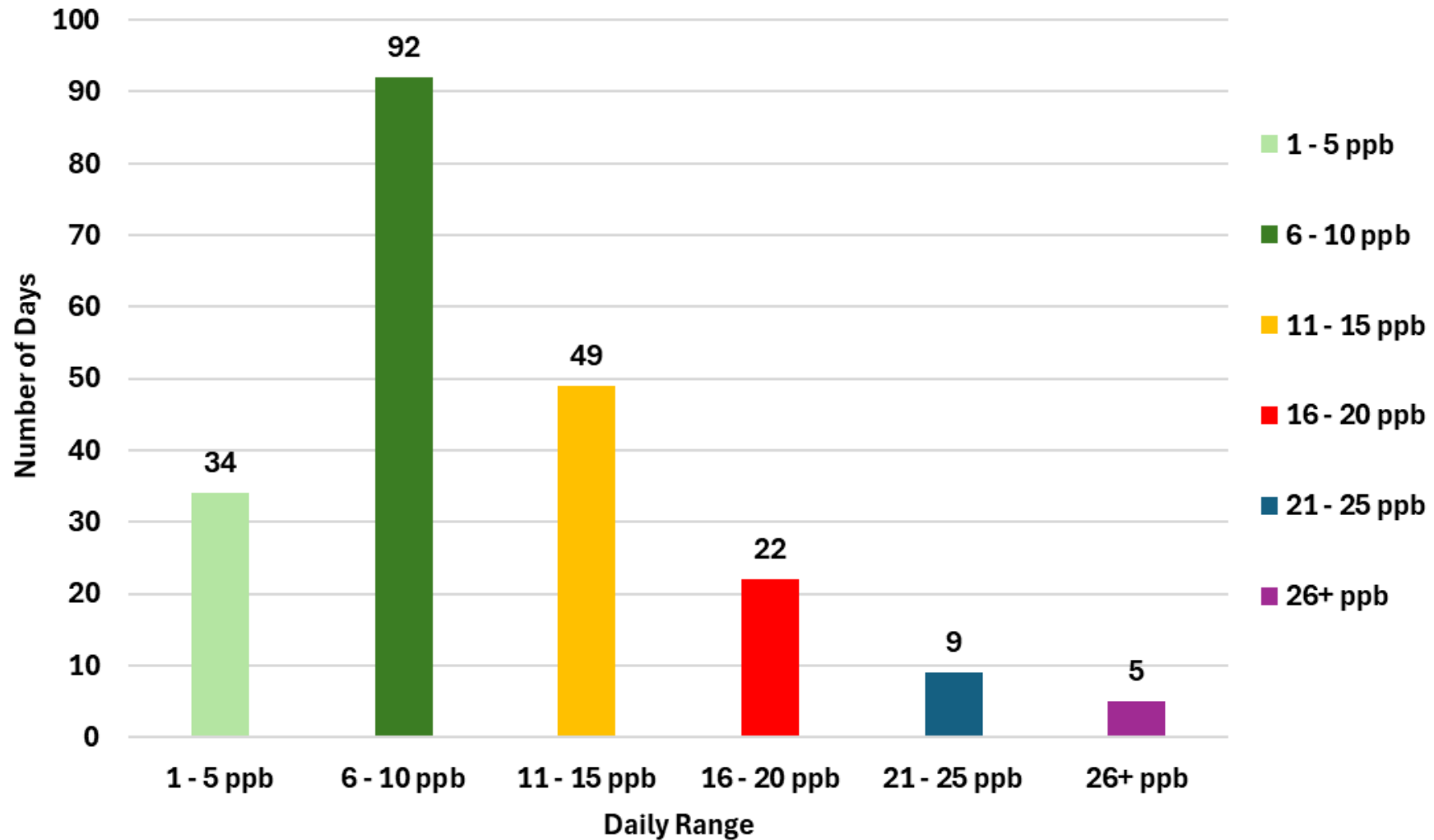
# RANGE OF OBSERVED MAX EIGHT-HOUR AVERAGE O<sub>3</sub> VALUES

Year	Non-Exceedance Days (ppb)	Exceedance Days (ppb)
2024	10.3	19.6
2025	11.1	19.6

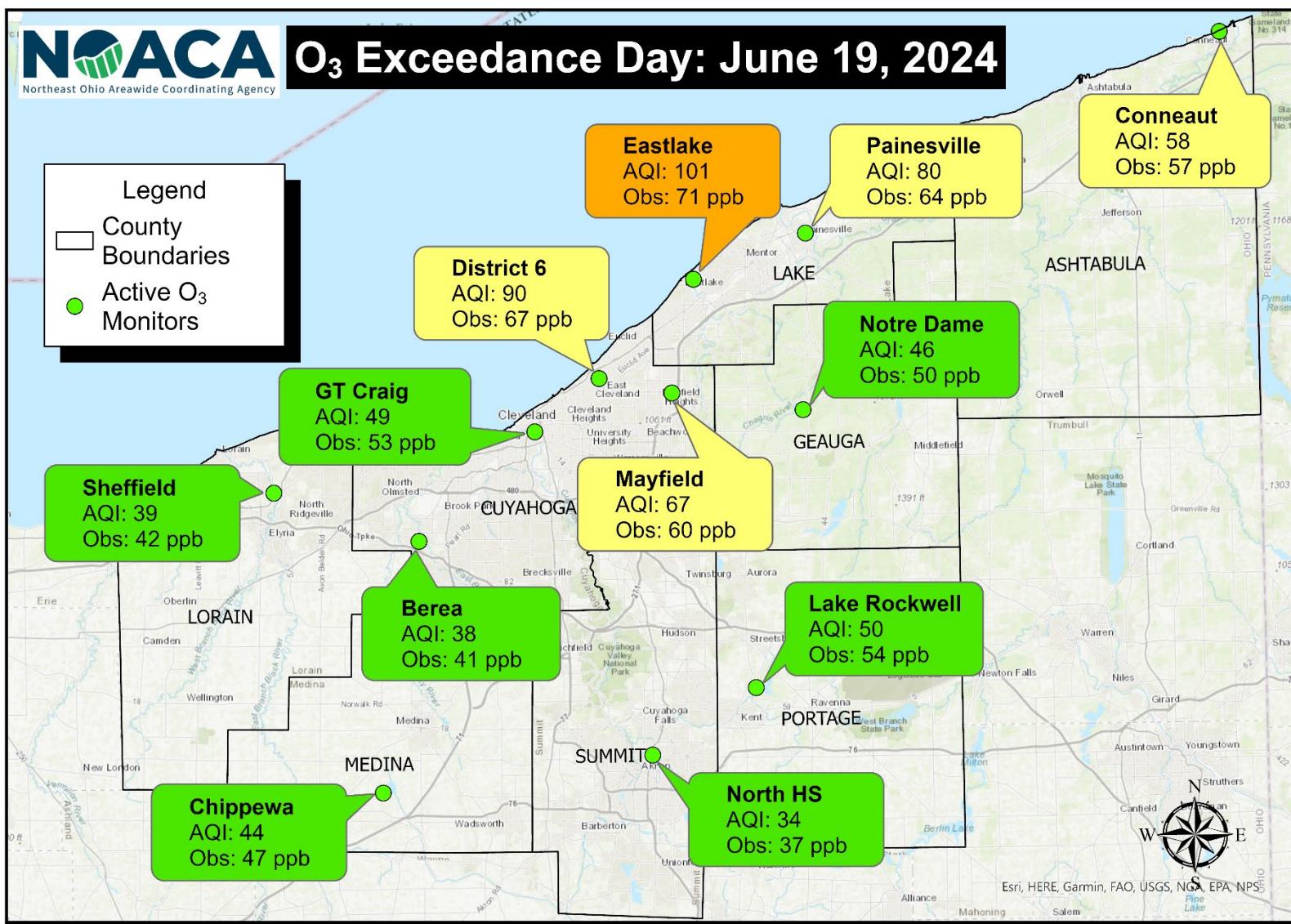
## Daily Range of Observed Maximum Eight-Hour O<sub>3</sub> Values - 2025



## Daily Range of Observed Maximum Eight-Hour O<sub>3</sub> Values - 2024



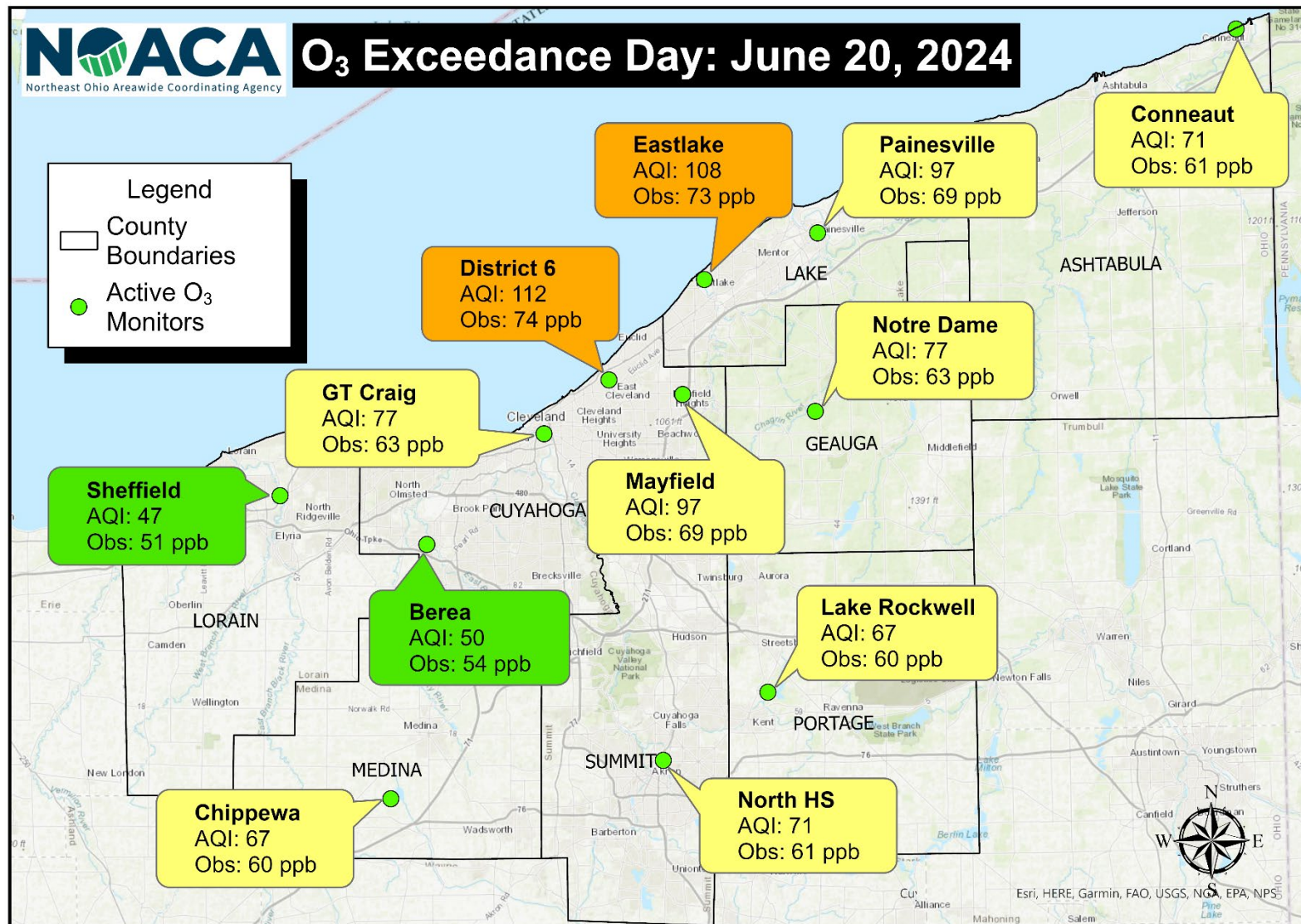
# O<sub>3</sub> Exceedance Day: June 19, 2024



Exceedance is based on the 2015 maximum eight-hour average ozone concentration (NAAQS = 70 ppb)

NOACA makes no representations or warranties with respect to accuracy and/or completeness of the map

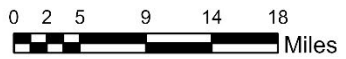
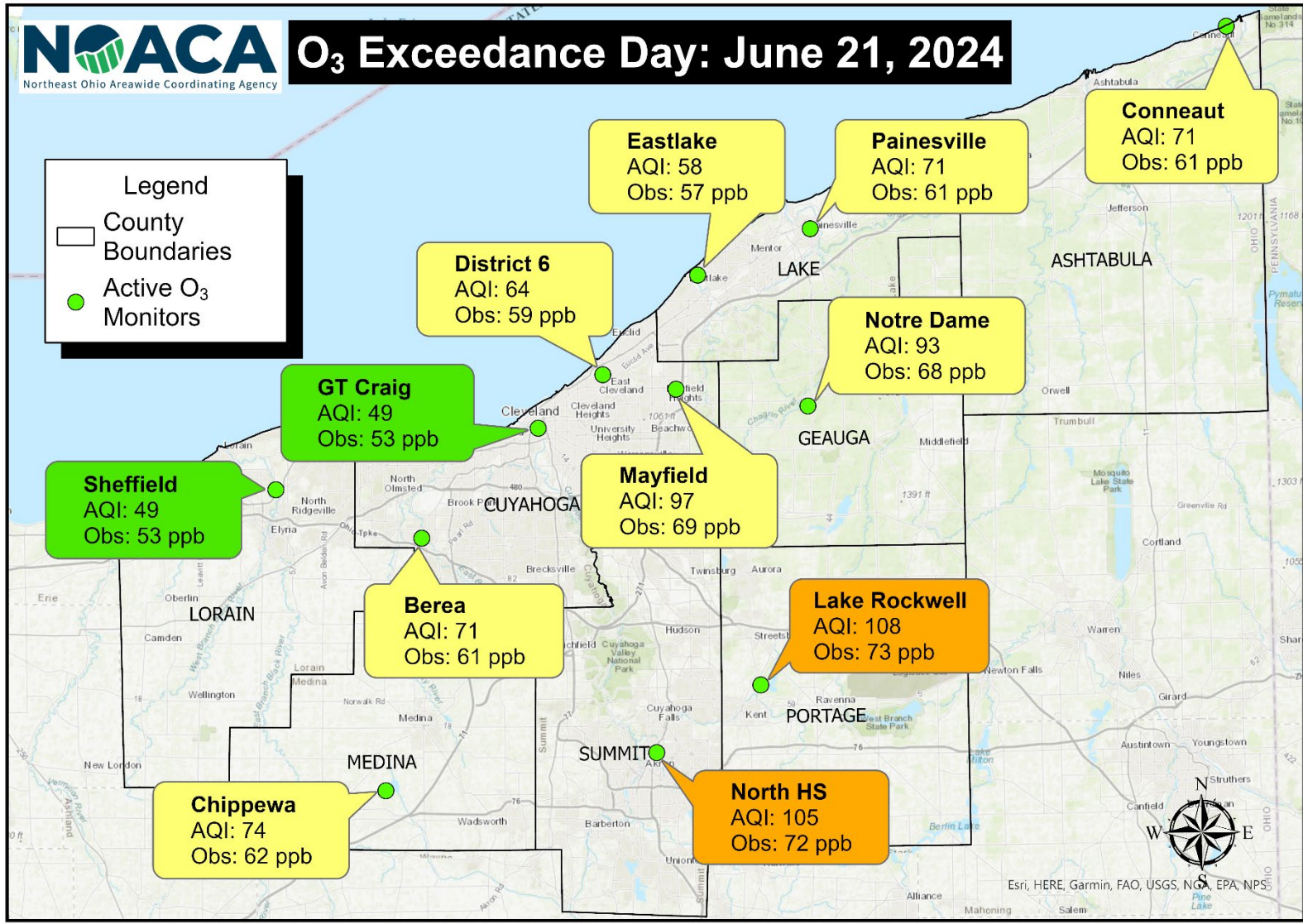
# O<sub>3</sub> Exceedance Day: June 20, 2024



Exceedance is based on the 2015 maximum eight-hour average ozone concentration (NAAQS = 70 ppb)

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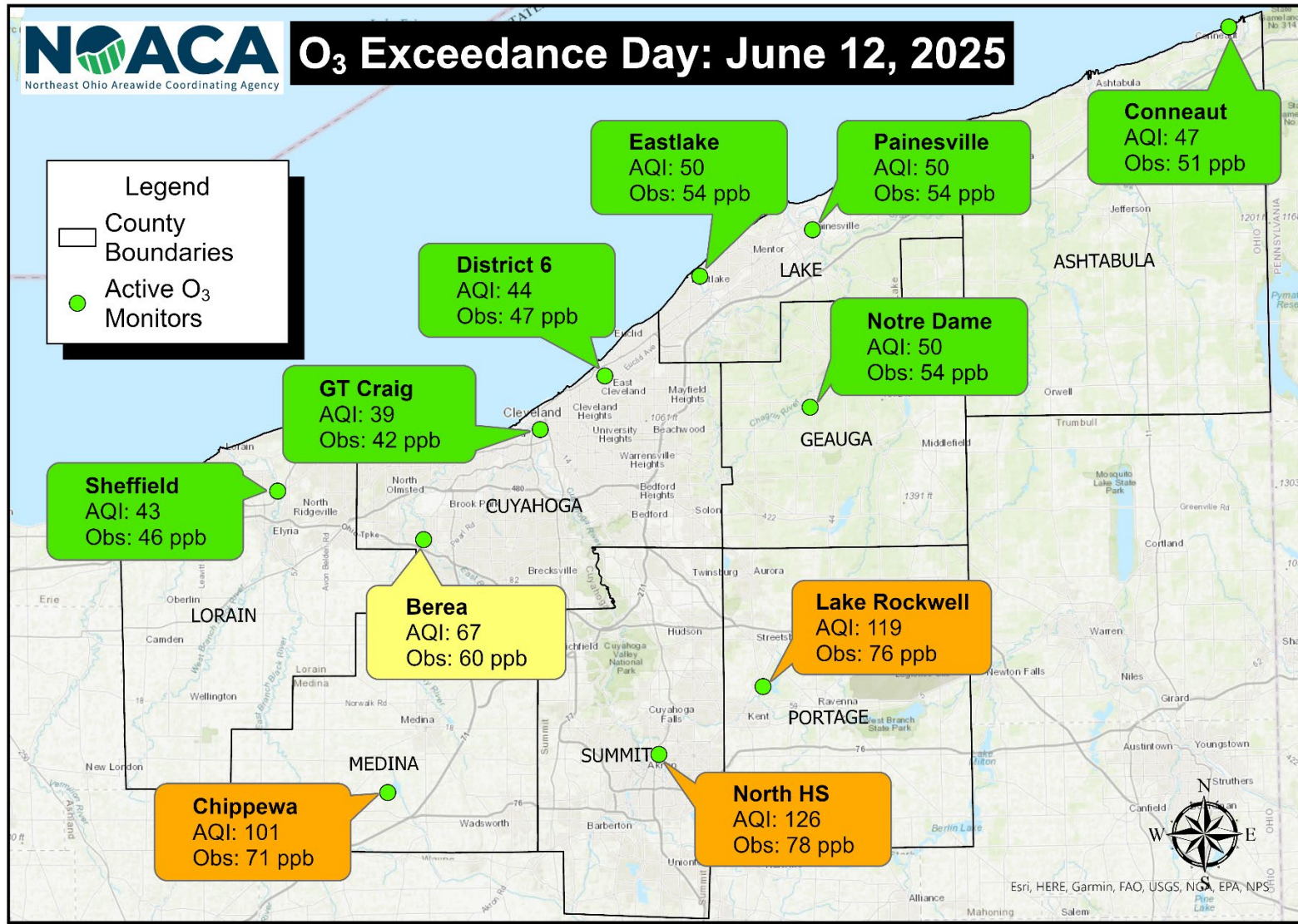
# O<sub>3</sub> Exceedance Day: June 21, 2024



Exceedance is based on the 2015 maximum eight-hour average ozone concentration (NAAQS = 70 ppb)

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# O<sub>3</sub> Exceedance Day: June 12, 2025

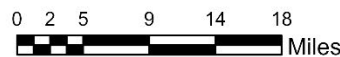
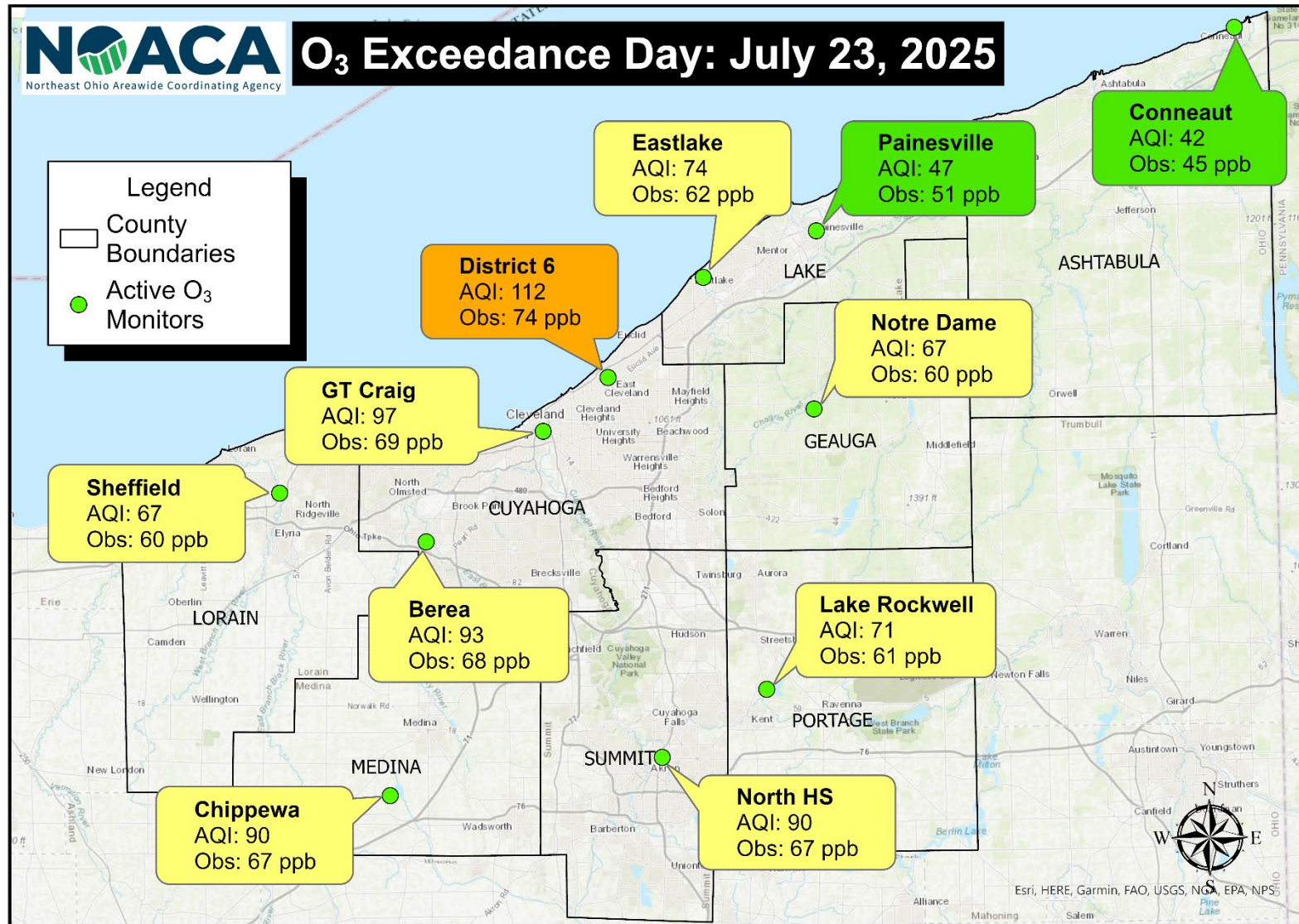


0 2 5 9 14 18  
Miles

Exceedance is based on the 2015 maximum eight-hour average ozone concentration (NAAQS = 70 ppb)

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# O<sub>3</sub> Exceedance Day: July 23, 2025



Exceedance is based on the 2015 maximum eight-hour average ozone concentration (NAAQS = 70 ppb)

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# NOACA AND NOAA 2025 FORECAST PERFORMANCE: PM<sub>2.5</sub>

Forecast		Threshold	
		12 µg/m <sup>3</sup>	35 µg/m <sup>3</sup>
Agency	NOACA	78%	99%
	NOAA 6Z (M/B)	(75/76)%	(99/99)%
	NOAA 12Z (M/B)	(75/76)%	(99/99)%

*M = Standard Model; B = Bias-Corrected Model*

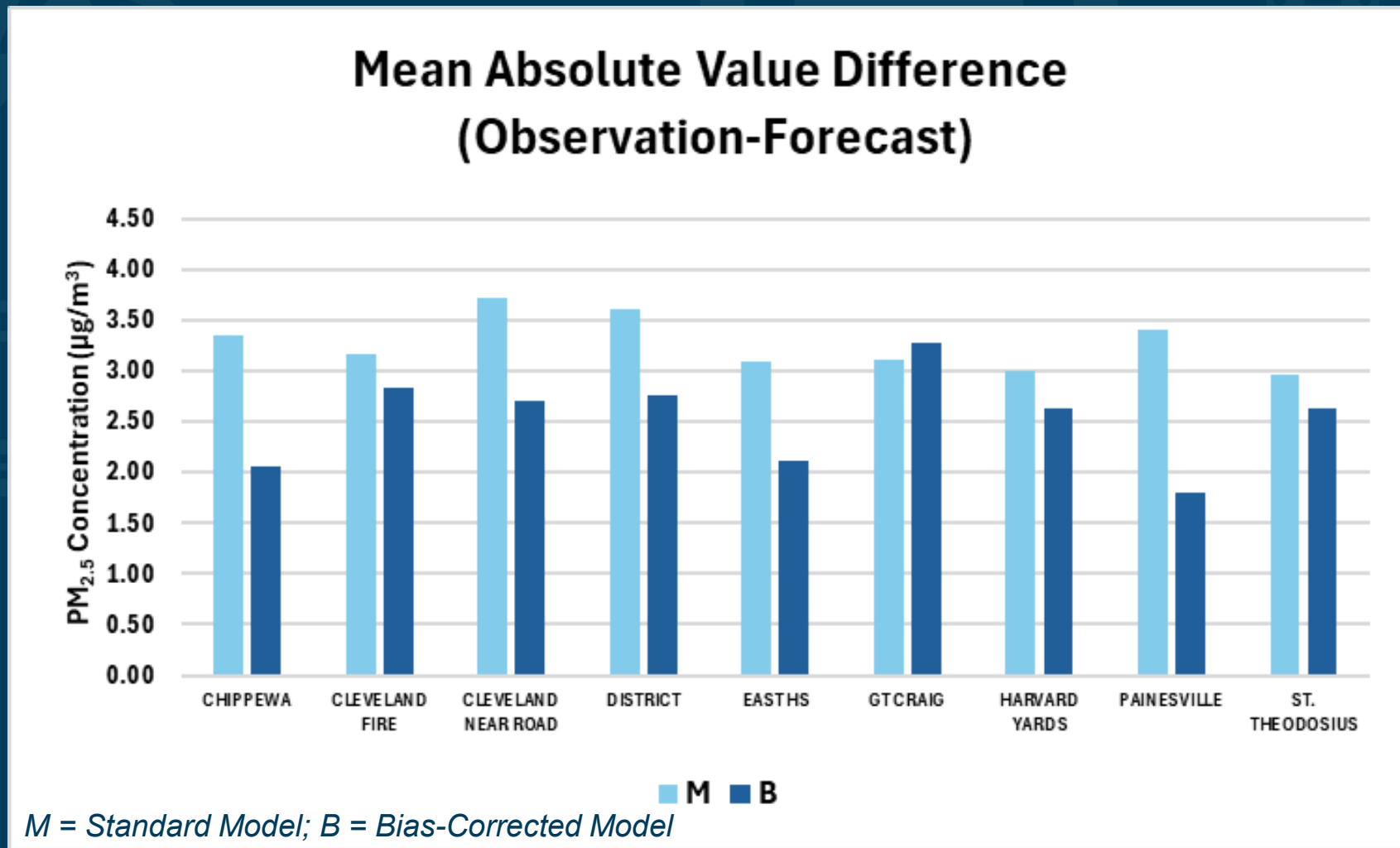
# EXCEEDANCE DAYS FOR 2025: PM<sub>2.5</sub>

DATE	FORECAST AQI		OBSERVED AQI	
	NOAA 6Z(M/B)/ 12Z(M/B)	NOACA	PEAK	# STATIONS
JUNE 7	2/2/2/2	2	3 (37)	1
AUGUST 4	2/2/2/2	2	3 (37)	3

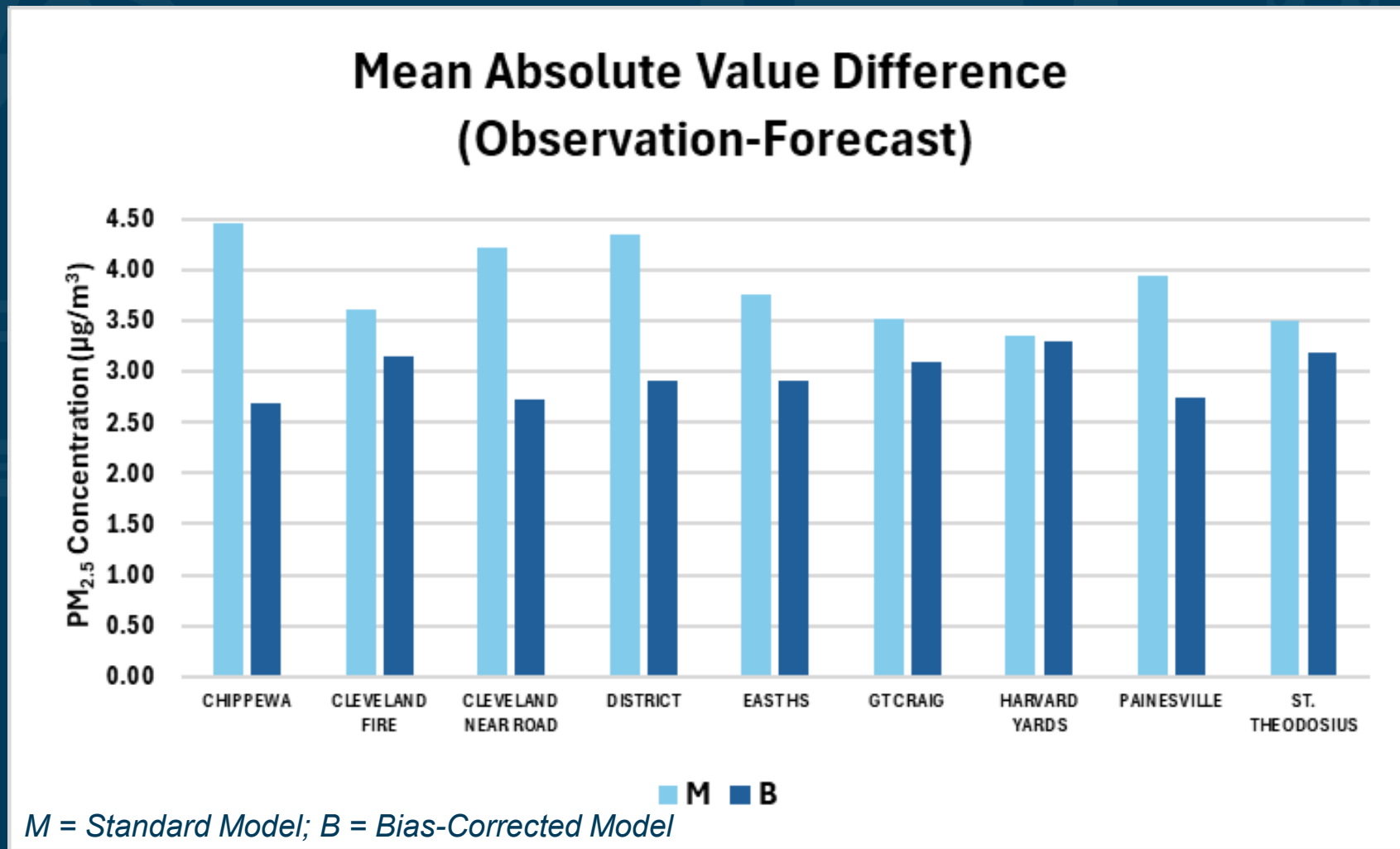
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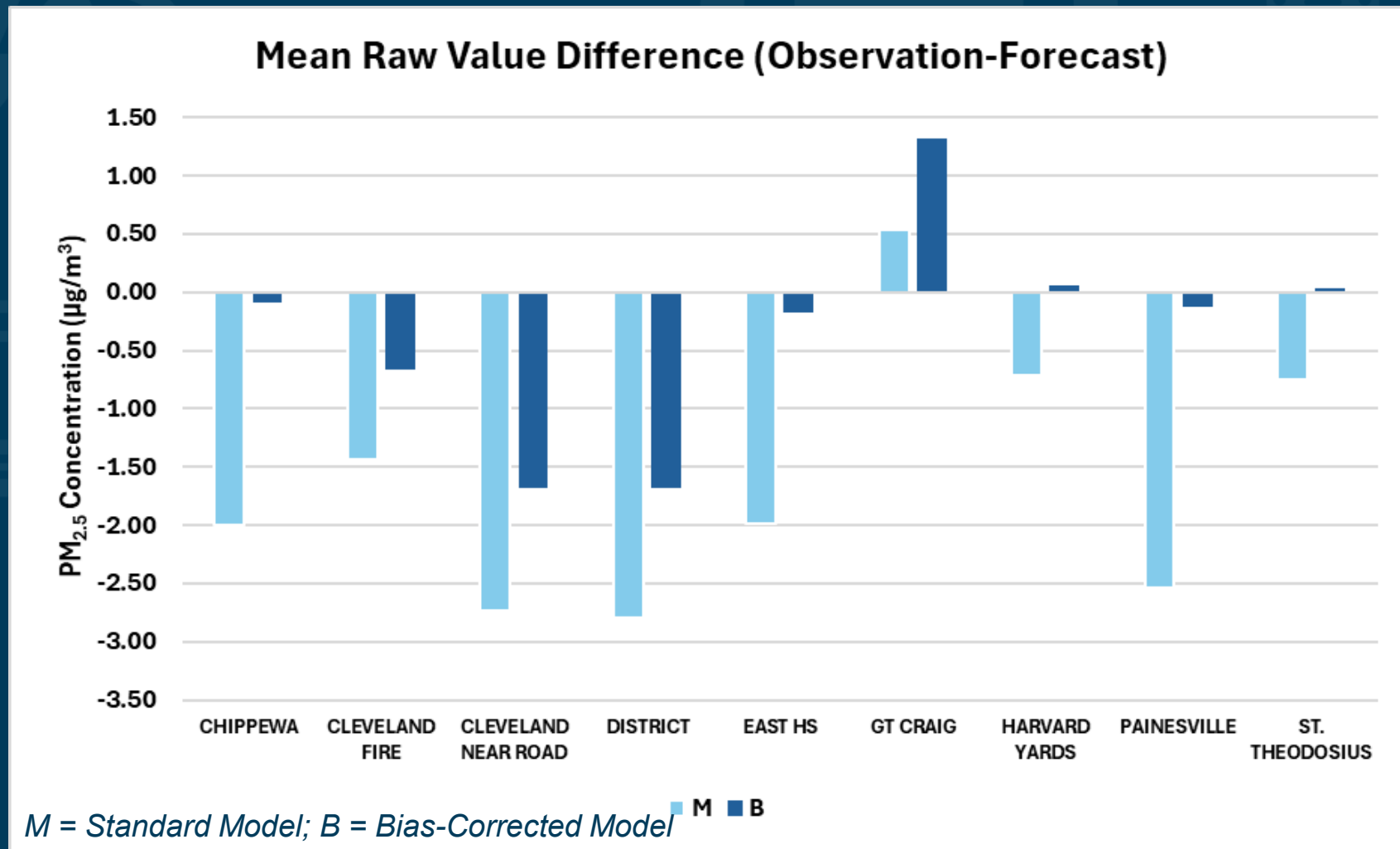
# PM<sub>2.5</sub> MONITOR PERFORMANCE 2024



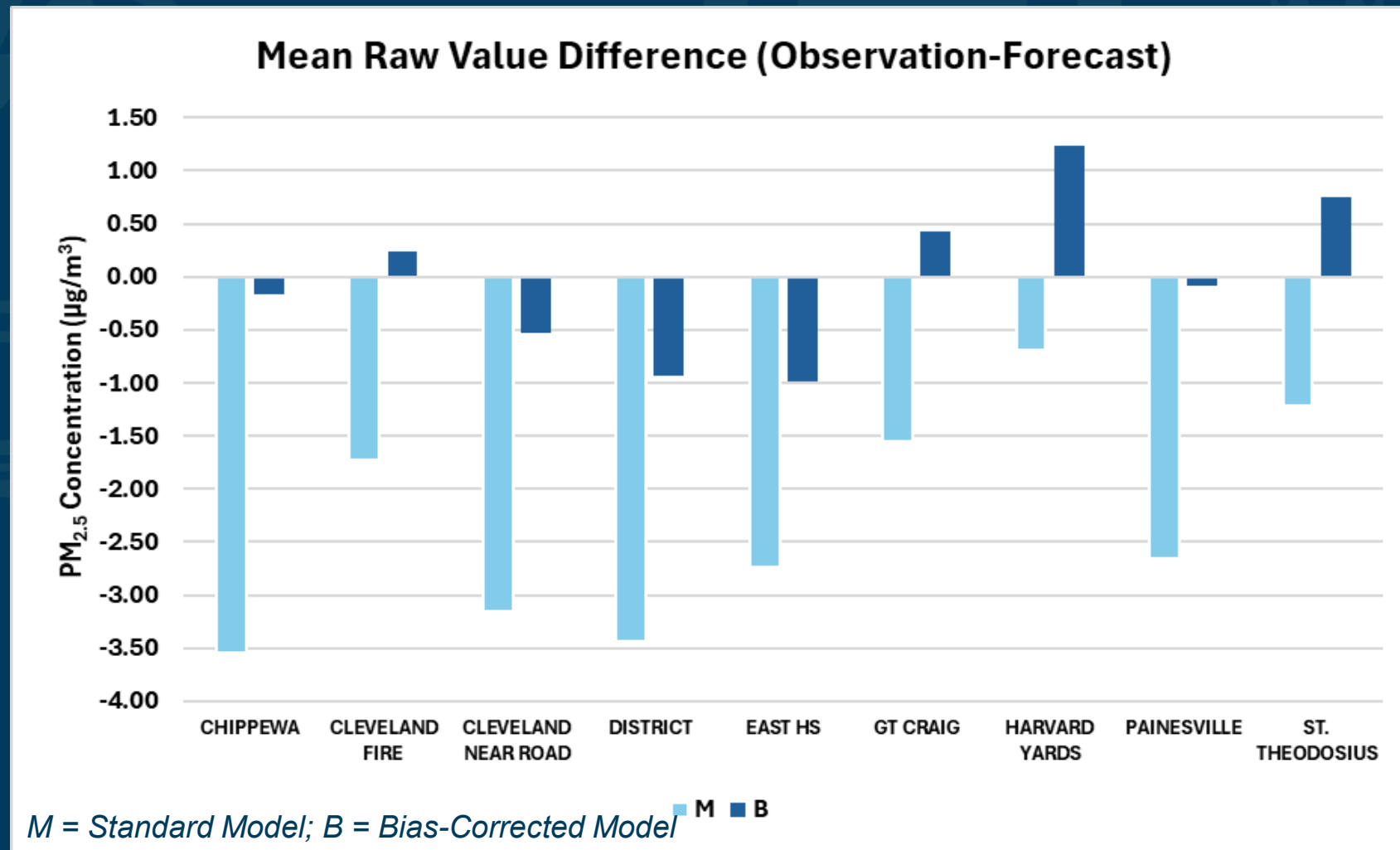
# PM<sub>2.5</sub> MONITOR PERFORMANCE 2025



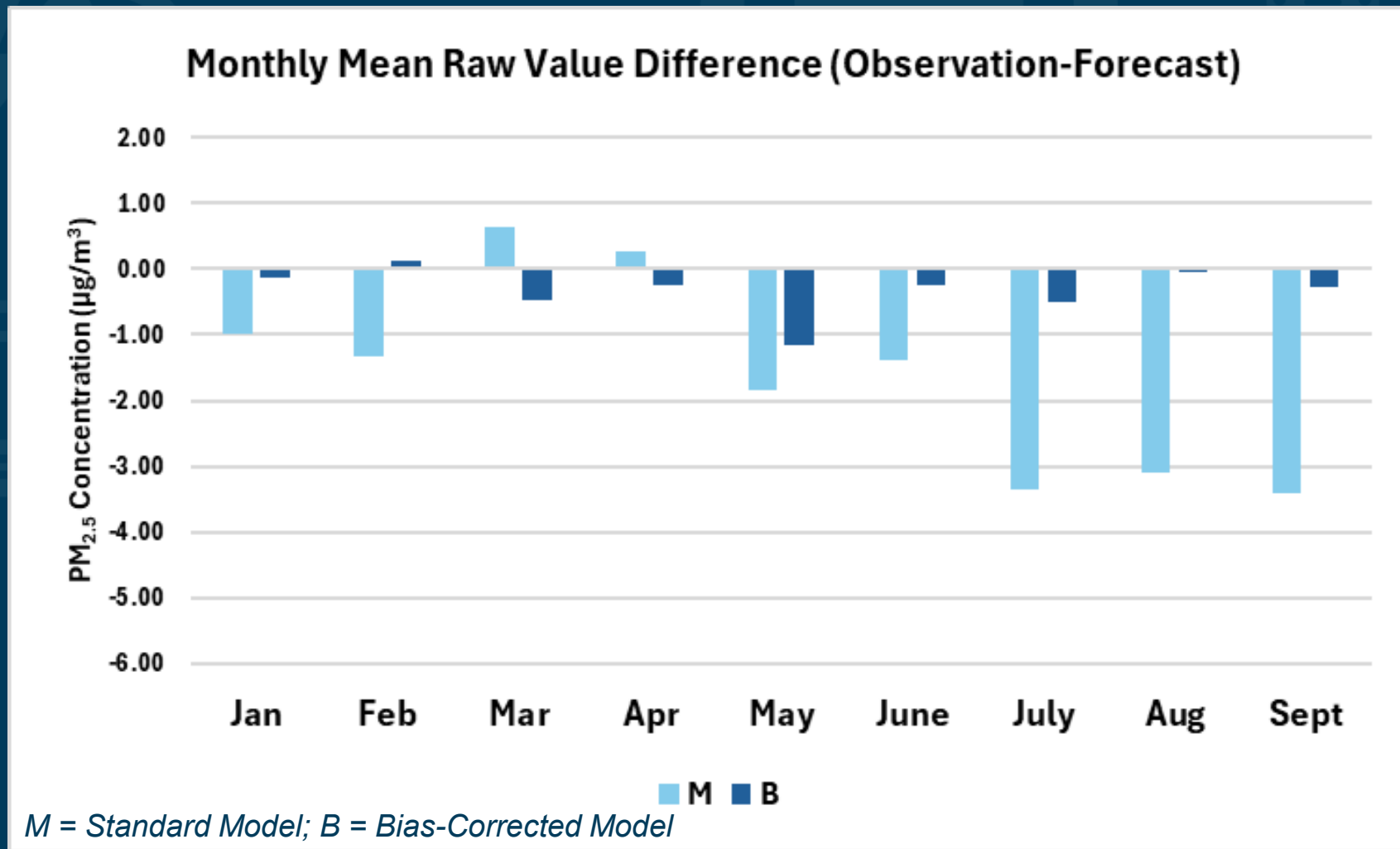
# PM<sub>2.5</sub> MONITOR PERFORMANCE 2024



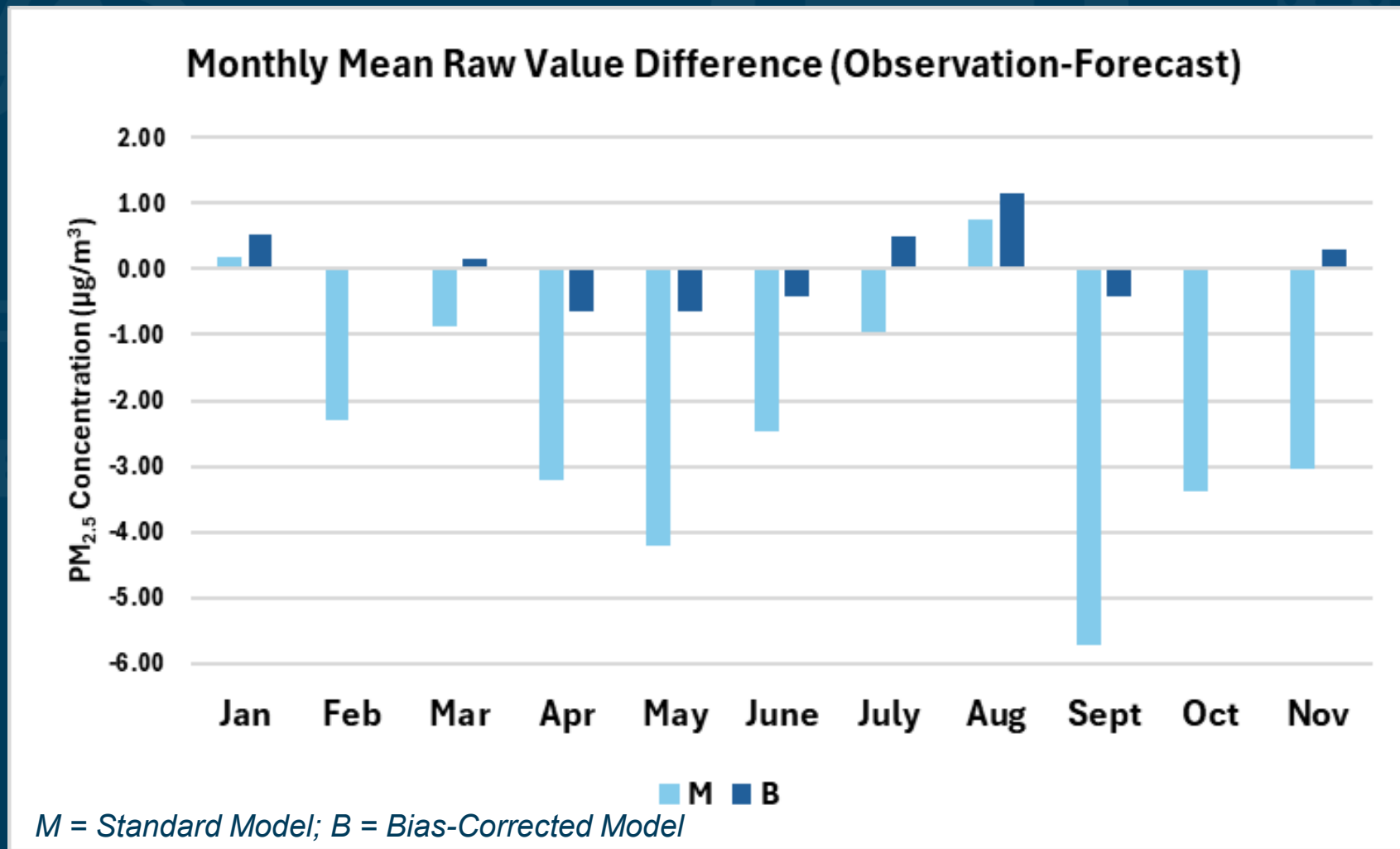
# PM<sub>2.5</sub> MONITOR PERFORMANCE 2025



# PM<sub>2.5</sub> MONITOR PERFORMANCE 2024



# PM<sub>2.5</sub> MONITOR PERFORMANCE 2025



# CONCLUSION

- NOAA models did not forecast ozone concentrations around the exceedance threshold as well in 2025 season (worse than 2024 season)
  - Fewer exceedance events, but one widespread event completely missed by 12Z bias-corrected model (July 15)
  - Zero accuracy of exceedance prediction at individual stations (0%)
- NOAA's PM<sub>2.5</sub> bias-corrected model (B) produced more accurate forecasts than the standard model (M); both models worse in 2025 versus 2024
- NOAA's PM<sub>2.5</sub> model forecast concentrations were generally higher than the observed concentrations (M consistently biased across stations)
- NOAA's PM<sub>2.5</sub> monthly bias stronger for M than B, especially May and September

# ACKNOWLEDGEMENTS



- Youngsun Jung, Program Manager
- Jason R. Anderson, OSTI Deputy Program Manager

- Kyle Spangle, Environmental Consultant within the Division of Air Pollution Control

# NEXT STEPS

- Track forecast performance of NOACA and NOAA for ozone and fine particulate matter
- Update Air Quality Subcommittee in March 2025
- Collaborate with NOAA personnel to report model performance in Northeast Ohio



# NOACA

Northeast Ohio Areawide Coordinating Agency

NOACA will **strengthen** regional cohesion, **preserve** existing infrastructure, and **build** a sustainable multimodal transportation system to **support** economic development and **enhance** quality of life in Northeast Ohio.