

2024 Ozone Year in Review

DEP Air Quality Technical Advisory Committee
2/6/2025





Agenda

- Understanding Ozone Basics
 - Ozone Formation
 - When is the Ozone Season?
 - PA Ozone Monitoring Locations
- Review of 2024 Weather and Ozone Concentrations
 - Weather features, including analysis of temperature and precipitation
 - Ozone Concentration Data
 - Ozone Episode Data
- Forecasting Air Quality
 - What is the Air Quality Index?
 - Air quality forecasting in PA
 - How are ozone exceedances shared with the public?



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Understanding Ozone Basics



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Ozone Formation

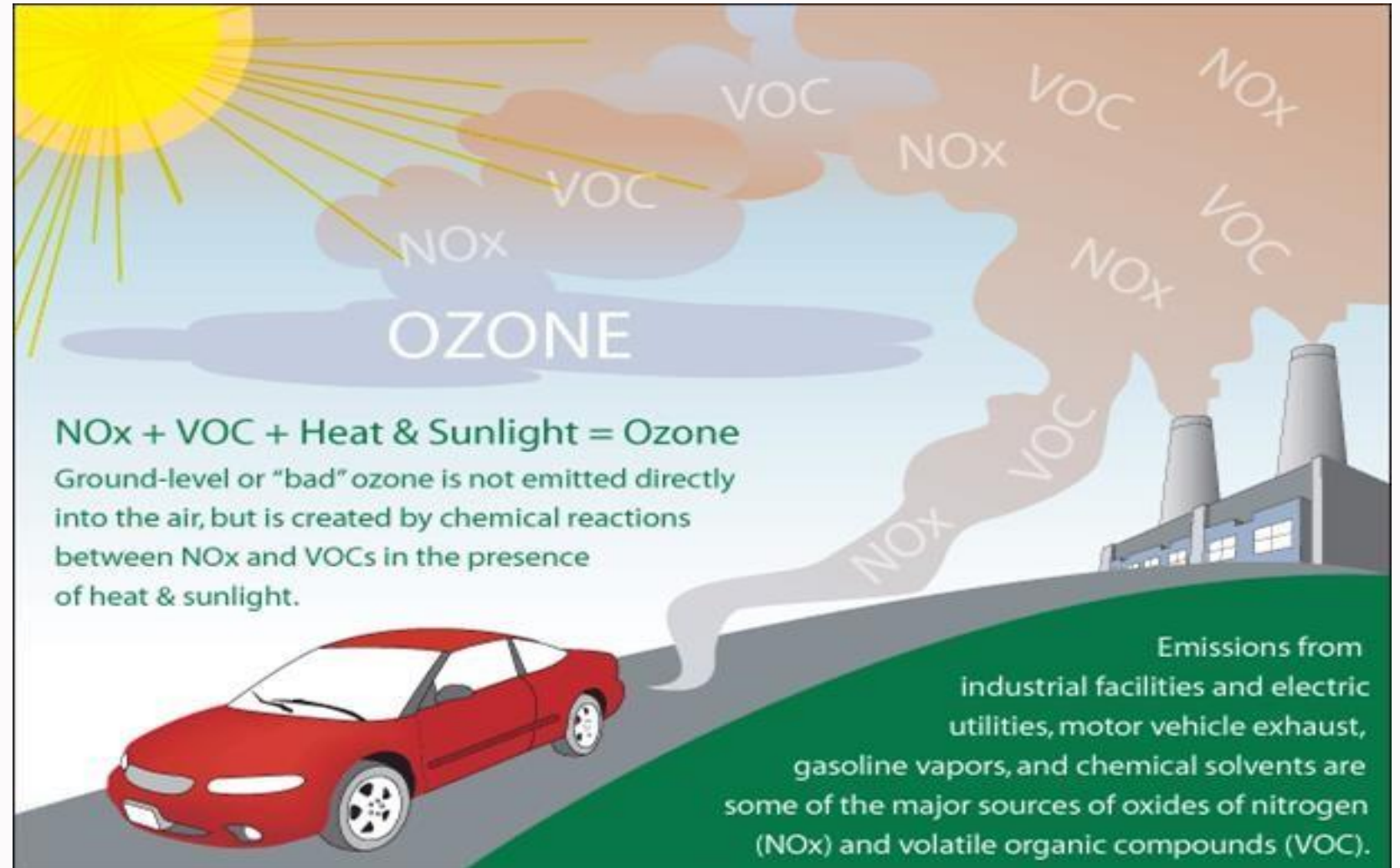


Photo: Ground level ozone formation, <https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics#formation>.

When is ozone season?

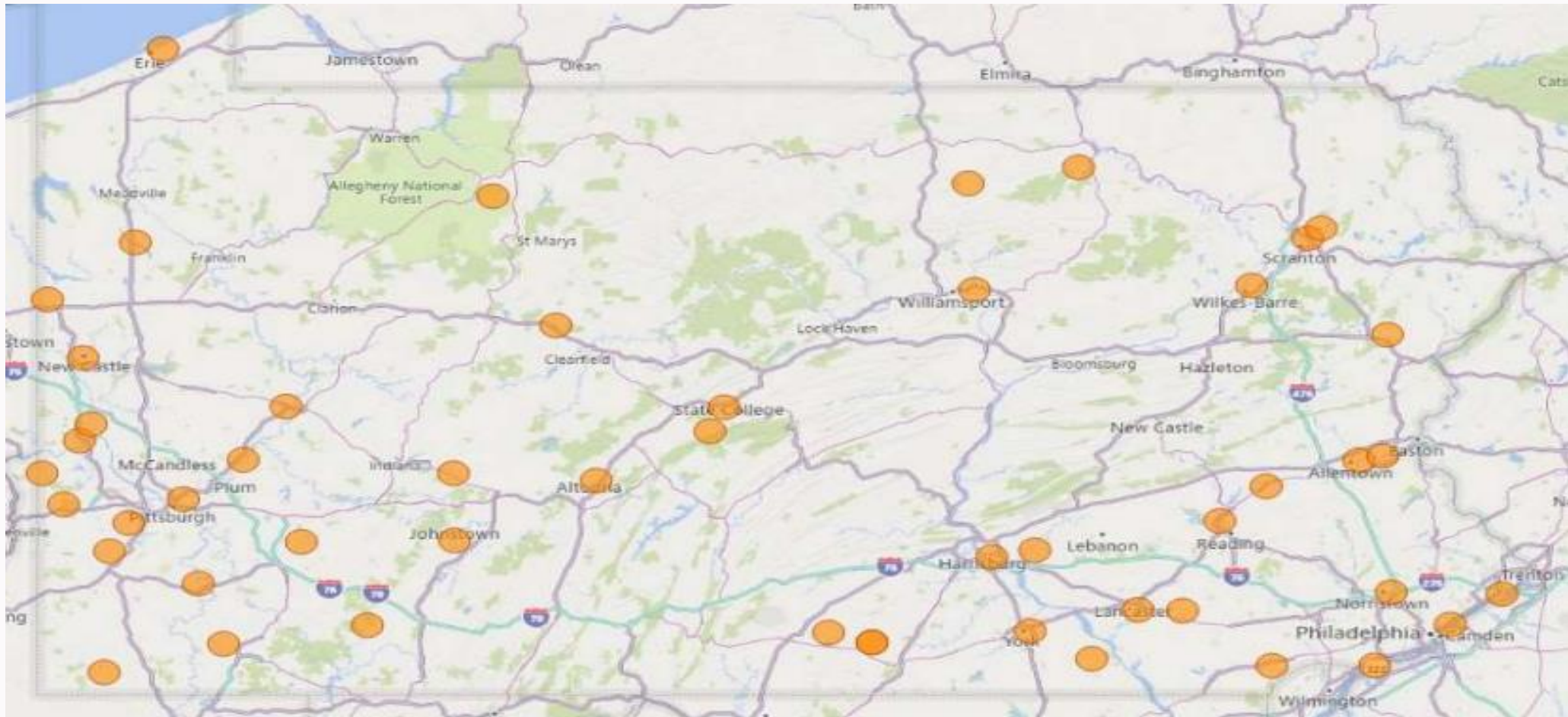
- DEP is required to monitor for ozone from March 1 to October 31 of each year
- DEP actually monitors for ozone year-round

SUN	MON	TUE	WED	THU	FRI	SAT
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2



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PA Ozone Monitoring Locations





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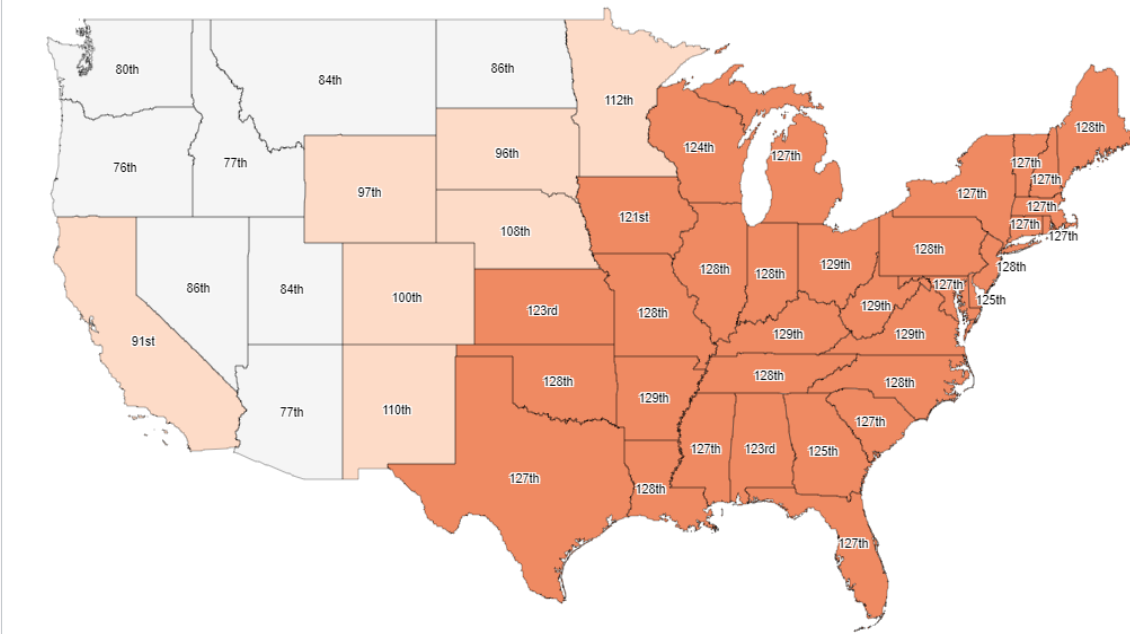
Review of 2024 Weather and Ozone Concentrations



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Meteorology – Spring 2024

Statewide Average Temperature Rank (130 years)
March - May 2024



Coldest $\downarrow \frac{1}{2}$ $\downarrow \frac{1}{4}$ Near Normal $\uparrow \frac{1}{4}$ $\uparrow \frac{1}{2}$ Warmest

Contiguous U.S. (Hover over a State)

Temp: 53.62°F

Anomaly: 2.71°F

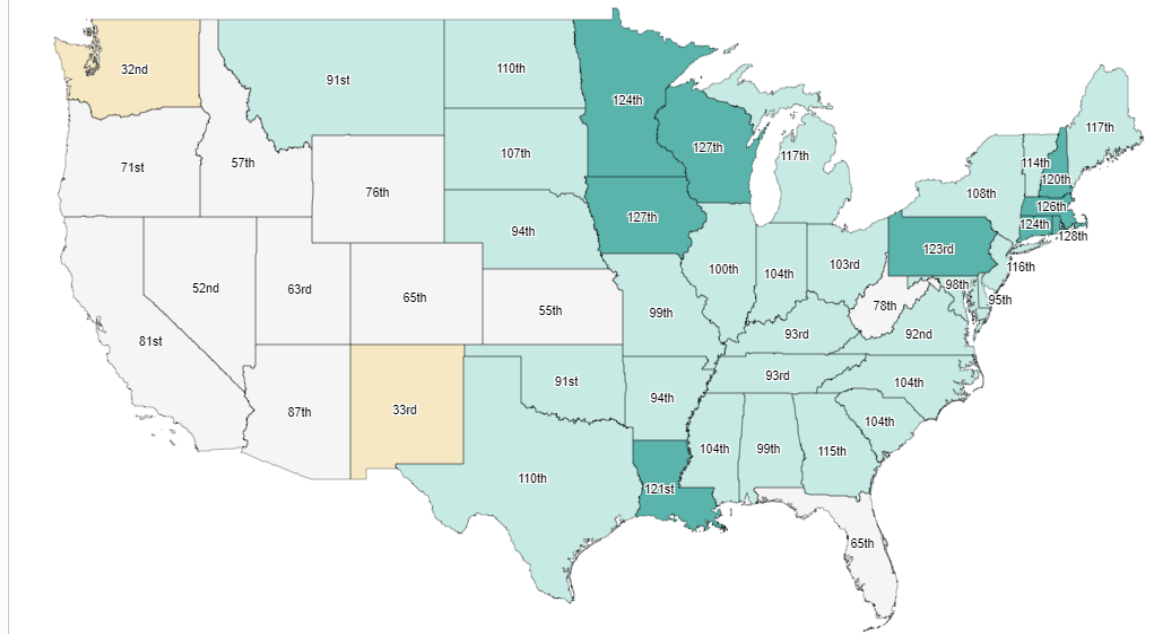
Rank: 7th Warmest

Mean: 50.91°F



Temperature

Statewide Precipitation Rank (130 years)
March - May 2024



Driest $\downarrow \frac{1}{2}$ $\downarrow \frac{1}{4}$ Near Normal $\uparrow \frac{1}{4}$ $\uparrow \frac{1}{2}$ Wettest

Contiguous U.S. (Hover over a State)

Precip: 9.32in

Anomaly: 1.39in

Rank: 15th Wettest

Mean: 7.93in



Precipitation

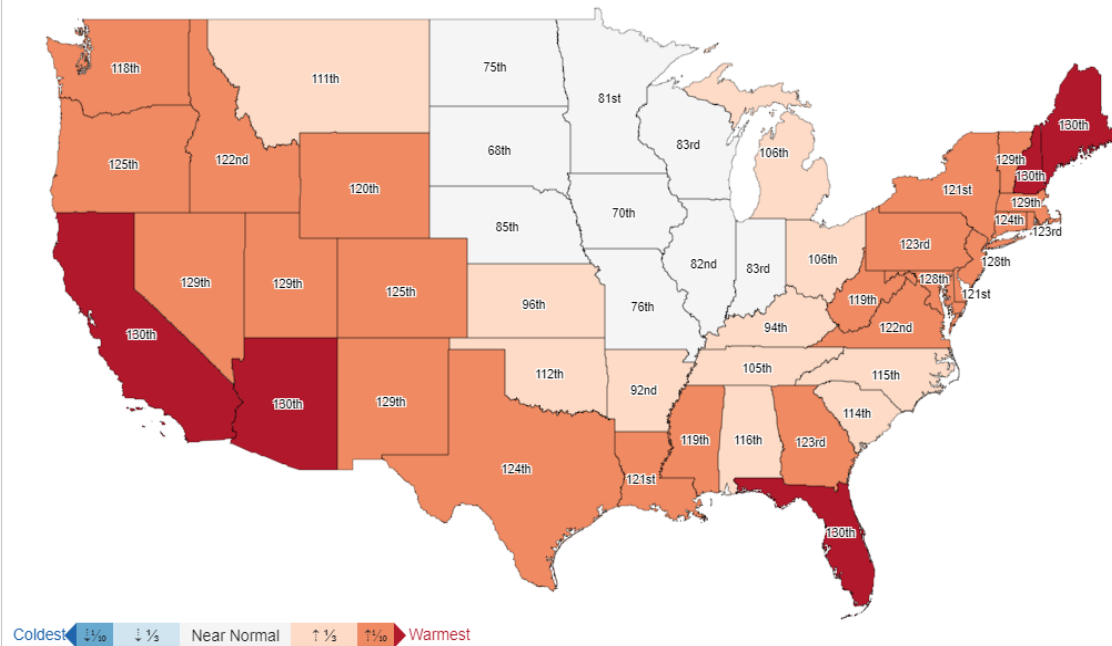


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Meteorology – Summer 2024

Statewide Average Temperature Rank (130 years)

June - August 2024



Coldest 1/2 1/2 Near Normal 1/2 1/2 Warmest

Contiguous U.S. (Hover over a State)

Temp: 73.82°F

Anomaly: 2.44°F

Rank: 4th Warmest

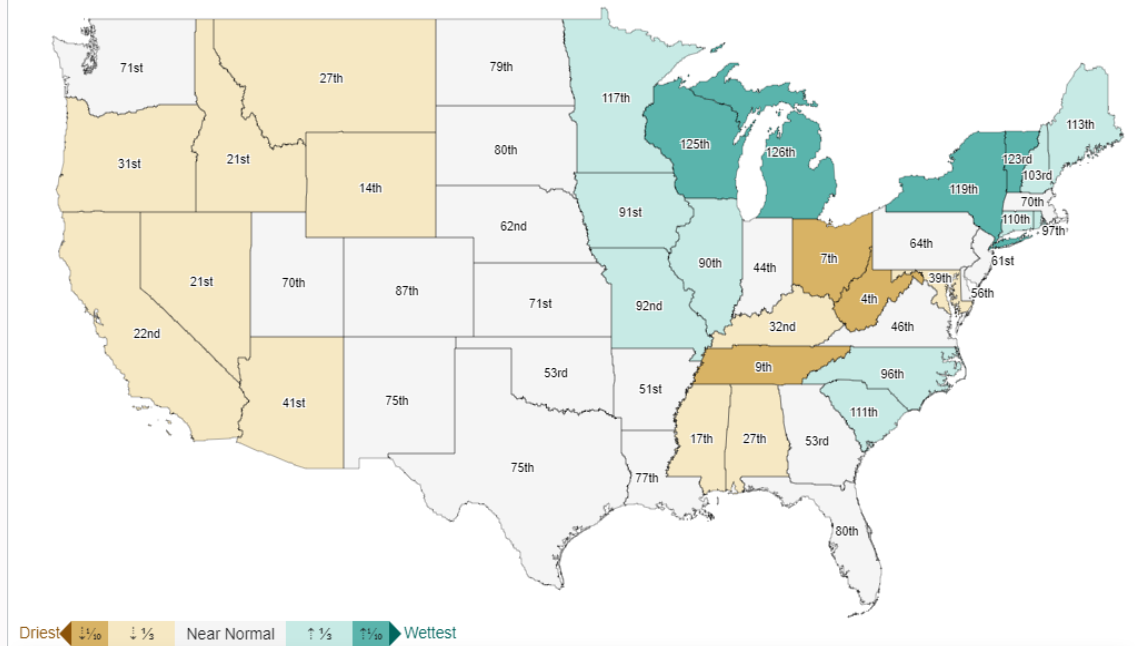
Mean: 71.38°F



Temperature

Statewide Precipitation Rank (130 years)

June - August 2024



Driest 1/2 1/2 Near Normal 1/2 1/2 Wettest

Contiguous U.S. (Hover over a State)

Precip: 8.29in

Anomaly: -0.03in

Rank: 58th Driest

Mean: 8.32in



Precipitation



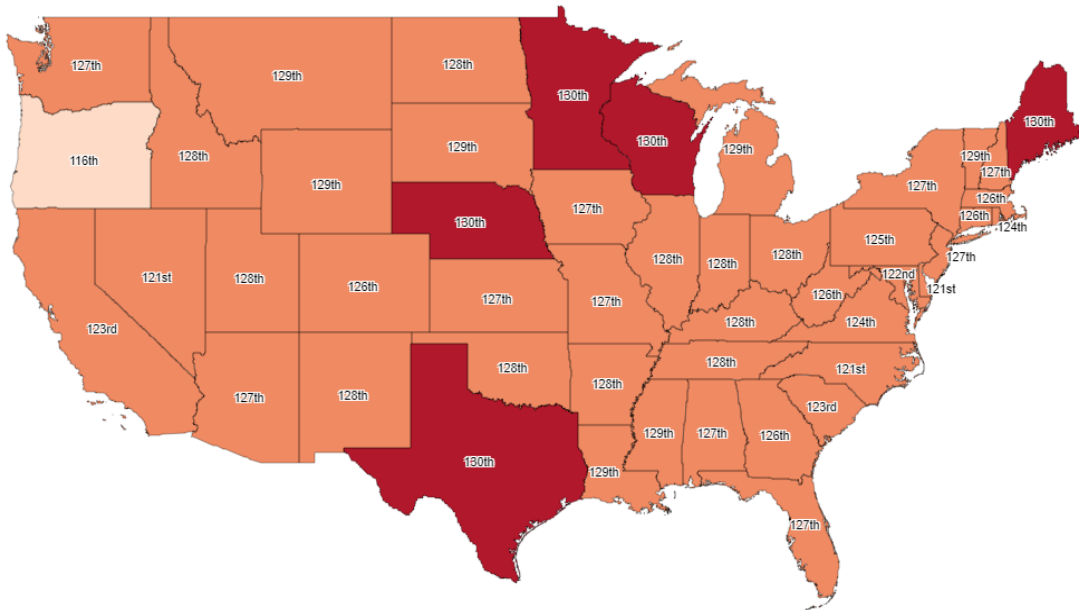
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Meteorology – Fall 2024

Statewide Average Temperature Rank (130 years)

September - November 2024

years)



Colest: $\frac{1}{10}$ $\frac{1}{2}$ Near Normal $\frac{1}{2}$ $\frac{1}{10}$ Warmest

Contiguous U.S. (Hover over a State)

Temp: 57.62°F

Anomaly: 4.08°F

Rank: Warmest

Mean: 53.54°F

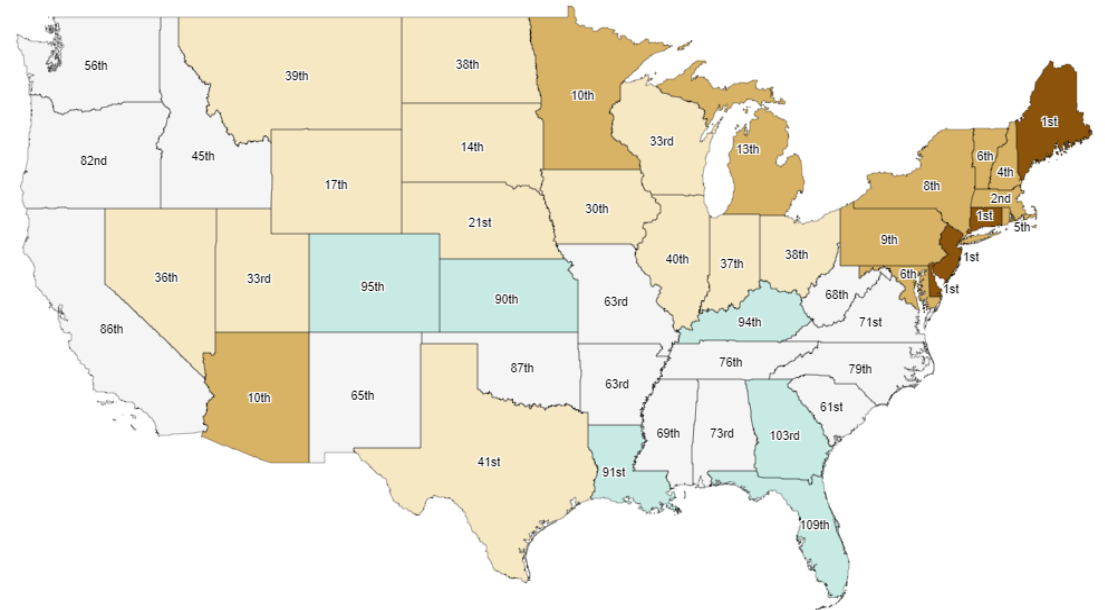


Temperature

Statewide Precipitation Rank (130 years)

September - November 2024

years)



Driest: $\frac{1}{10}$ $\frac{1}{2}$ Near Normal $\frac{1}{2}$ $\frac{1}{10}$ Wettest

Contiguous U.S. (Hover over a State)

Precip: 6.23in

Anomaly: -0.65in

Rank: 36th Driest

Mean: 6.88in



Precipitation

2024 Ozone Monitoring Summary

- Overview of the projected 2024 design values (DV)* for the 8-hour ozone national ambient air quality standard (NAAQS).
- 2024 DV calculation – Calculate daily maximum 8-hour ozone concentration. Determine 4th high from 2022, 2023, and 2024 averaged over a 3-year period.

* Please note that 2024 ozone data has not been fully QA/QC'd.



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Number of 8-hour Ozone Exceedances

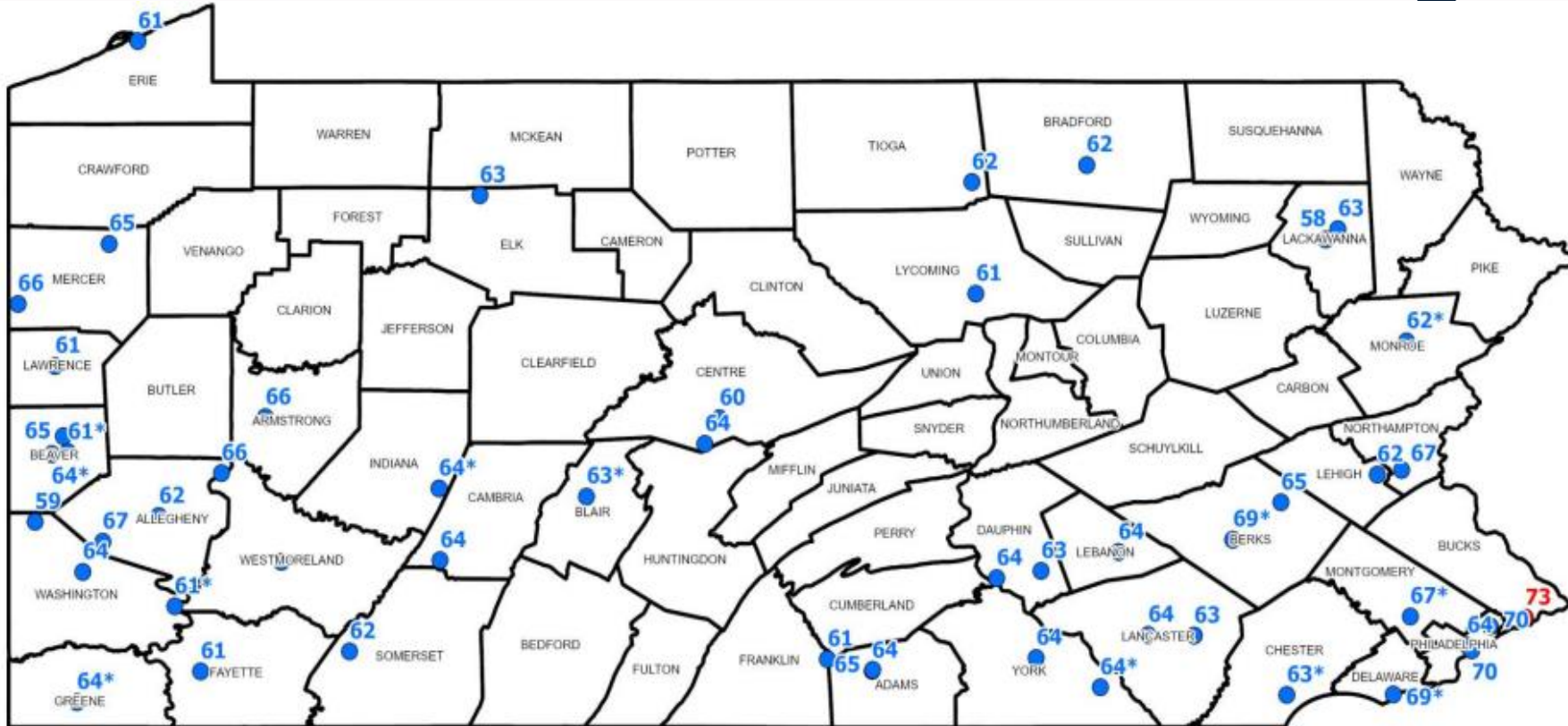
Number of 8-hour ozone exceedance days of 2015 ozone NAAQS (0.070 parts per million or 70 parts per billion) and total number of ozone exceedances per year within Pennsylvania.

- 2024: 21 days | 58 total exceedances*
- 2023: 18 days | 115 total exceedances
- 2022: 5 days | 26 total exceedances

* 2024 ozone data has not been fully QA/QC'd.



2023 8-hour Ozone Design Values



Appearing in Red – 2023 8-hour ozone design value above 70 ppb (2015 Ozone Standard)

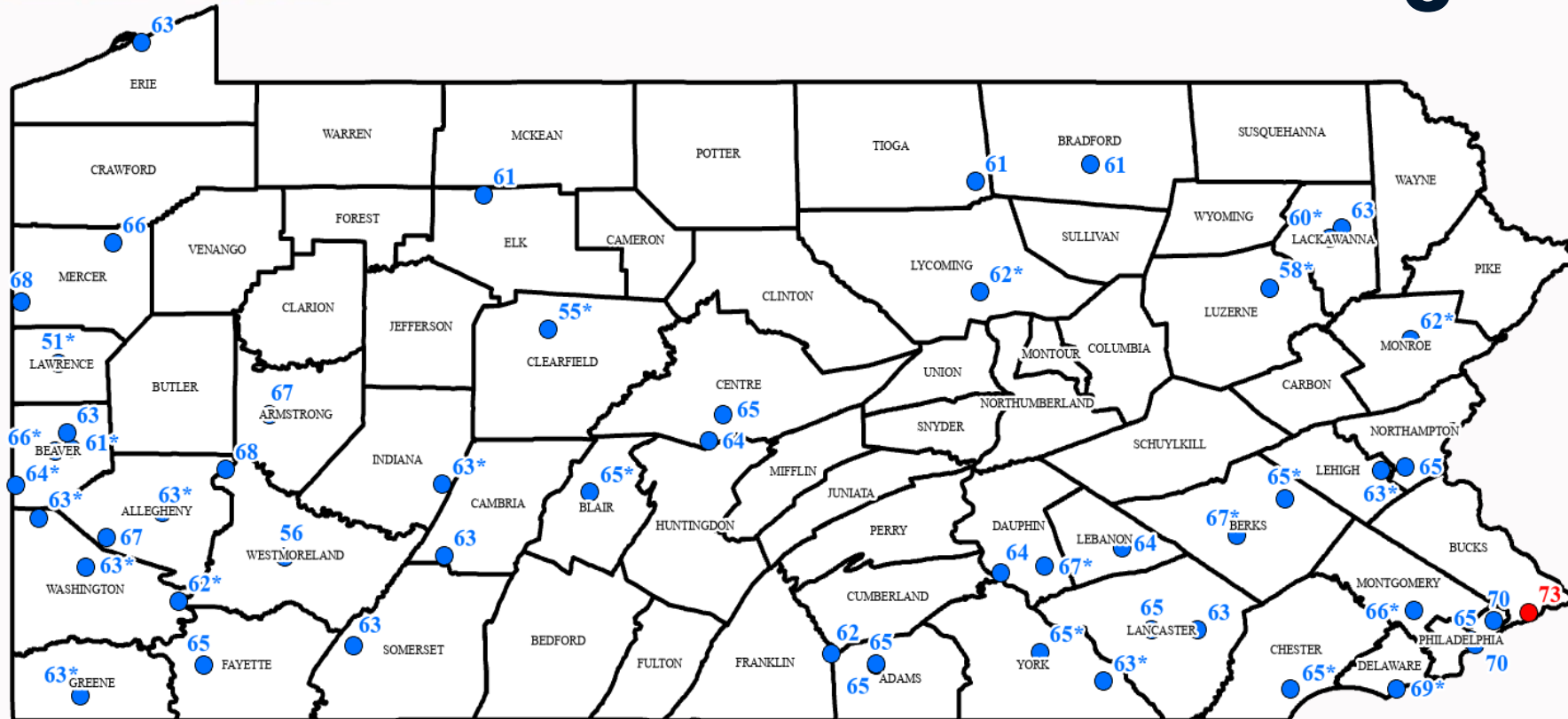
Appearing in Blue – 2023 8-hour ozone design value at or below 70 ppb (2015 Ozone Standard)

Asterisk (*) appearing behind the design value means the data is incomplete during 3-year period.



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2024 8-hour Ozone Design Values





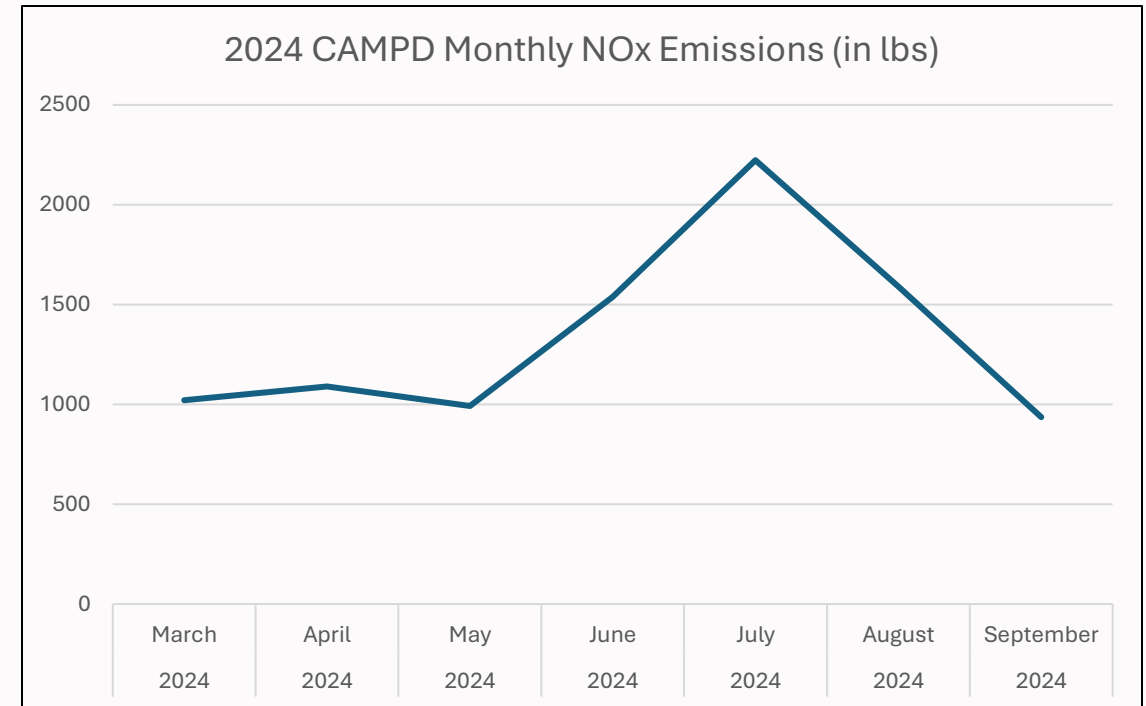
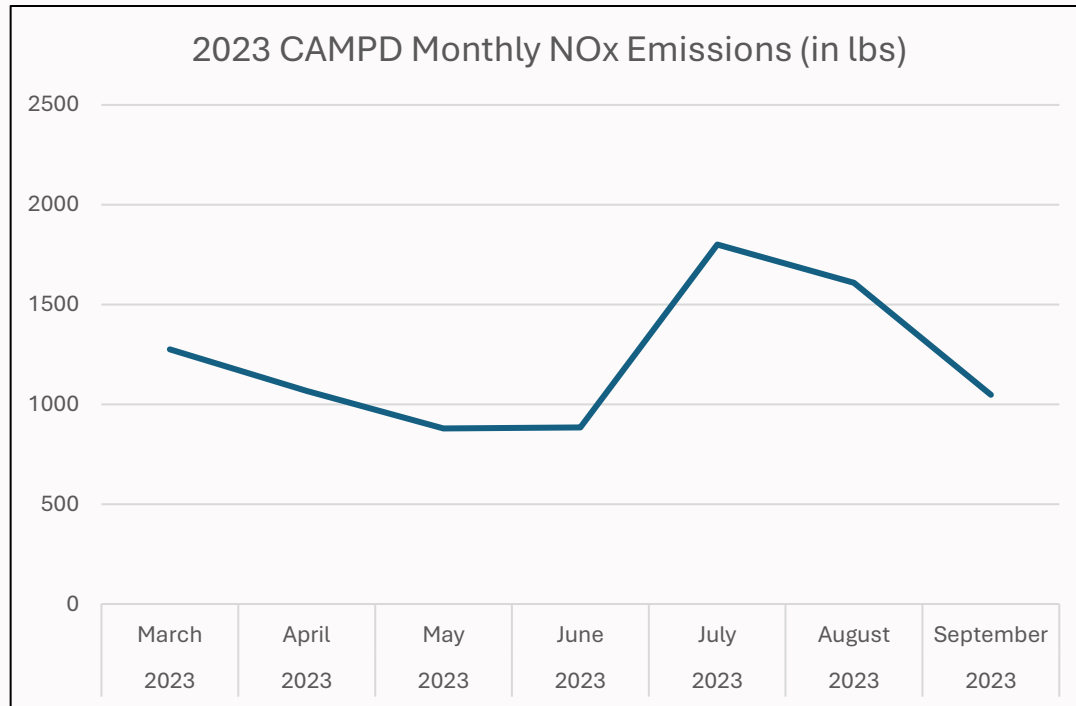
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2024 Ozone Episode Data

- 2024 had half the number of ozone exceedances compared to 2023.
- 2024 did not see a large frequency of days impacted from smoke associated with wildfires, compared to 2023 or 2016.



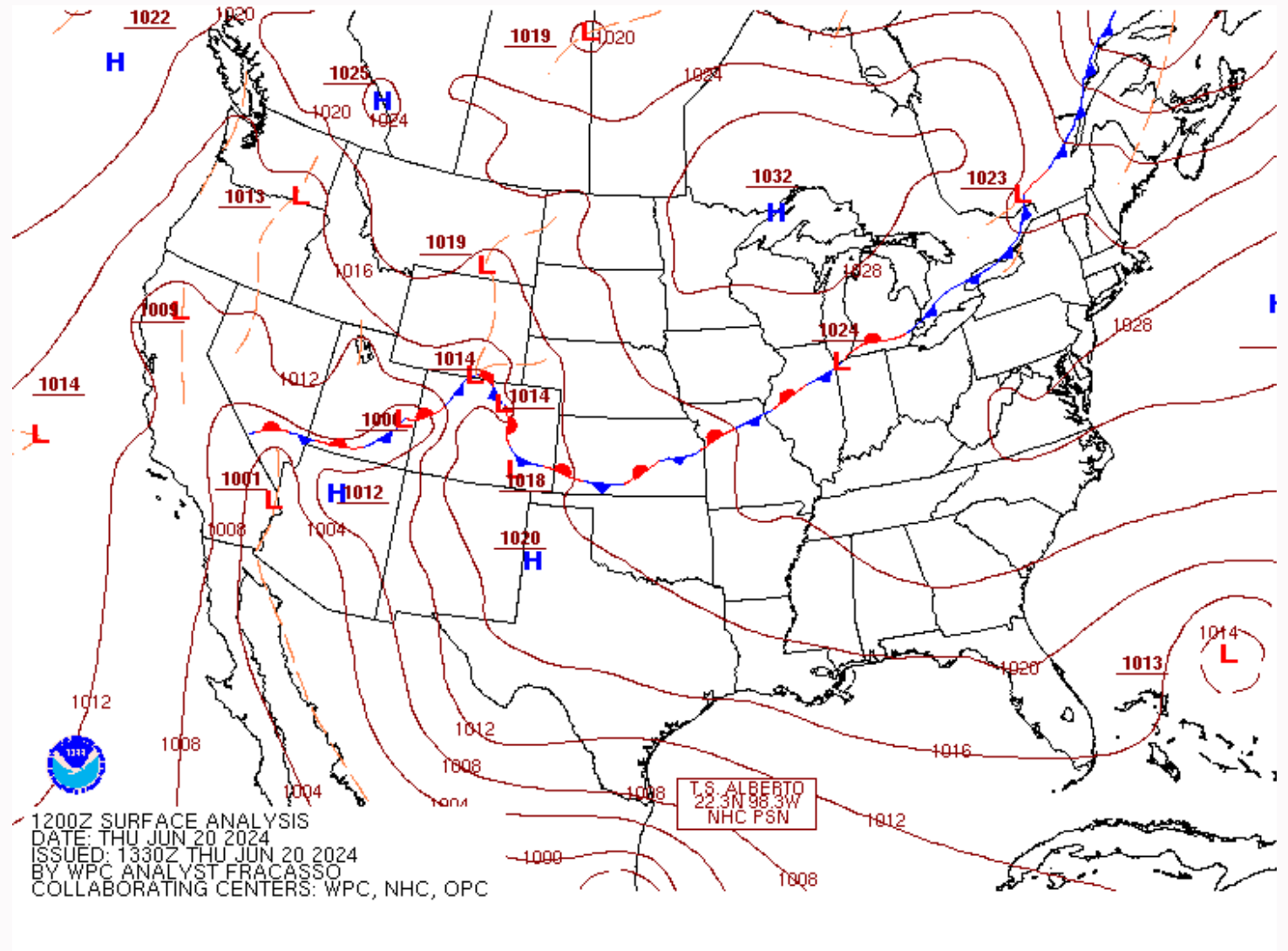
EPA Clean Air Markets Program Data



Although June through August had higher NOx emissions, there were not nearly as many exceedances during this time as in 2023, primarily due to the 2023 wildfires.



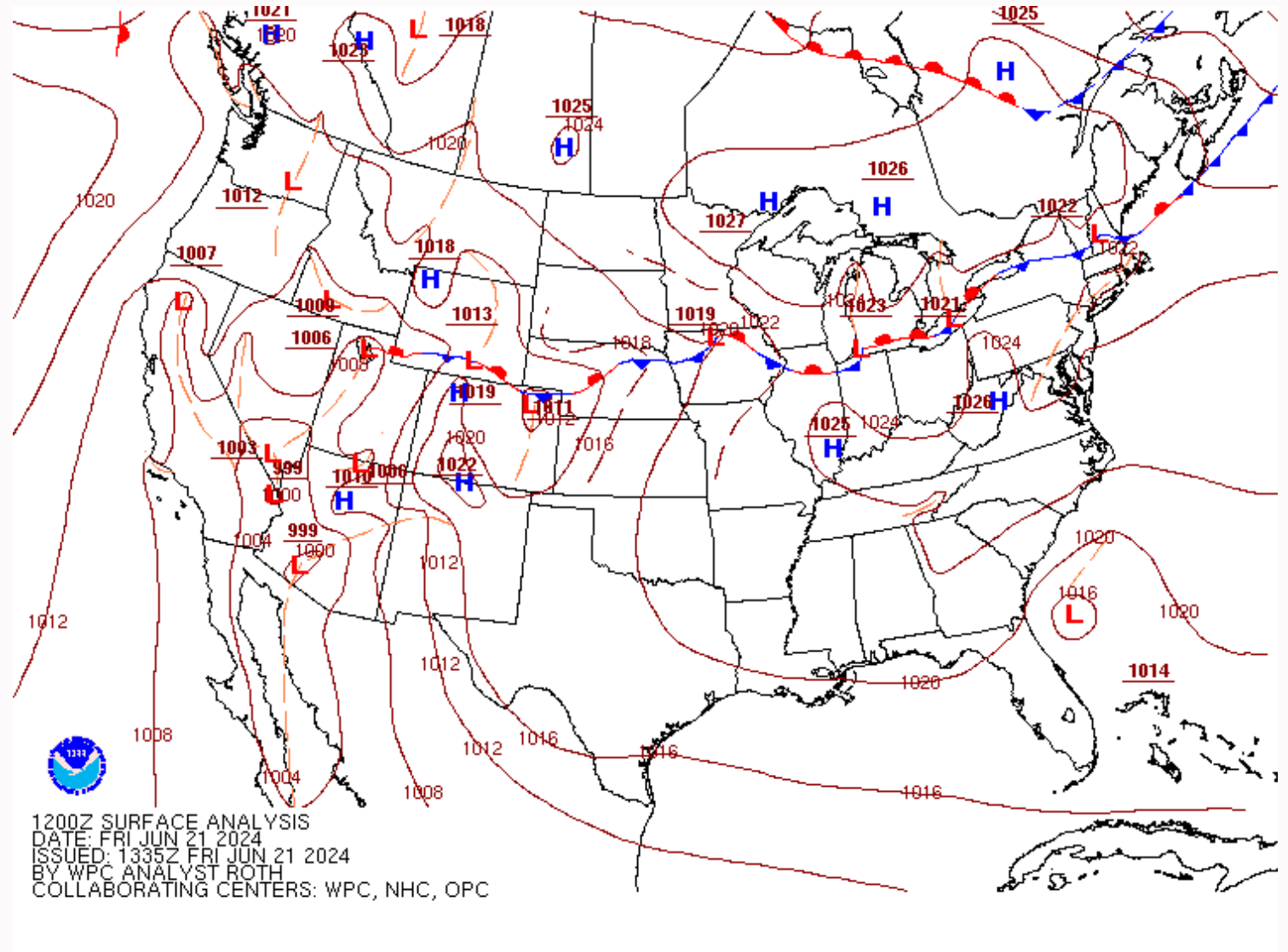
Ozone Episode – June 20, 2024 (Surface Map)





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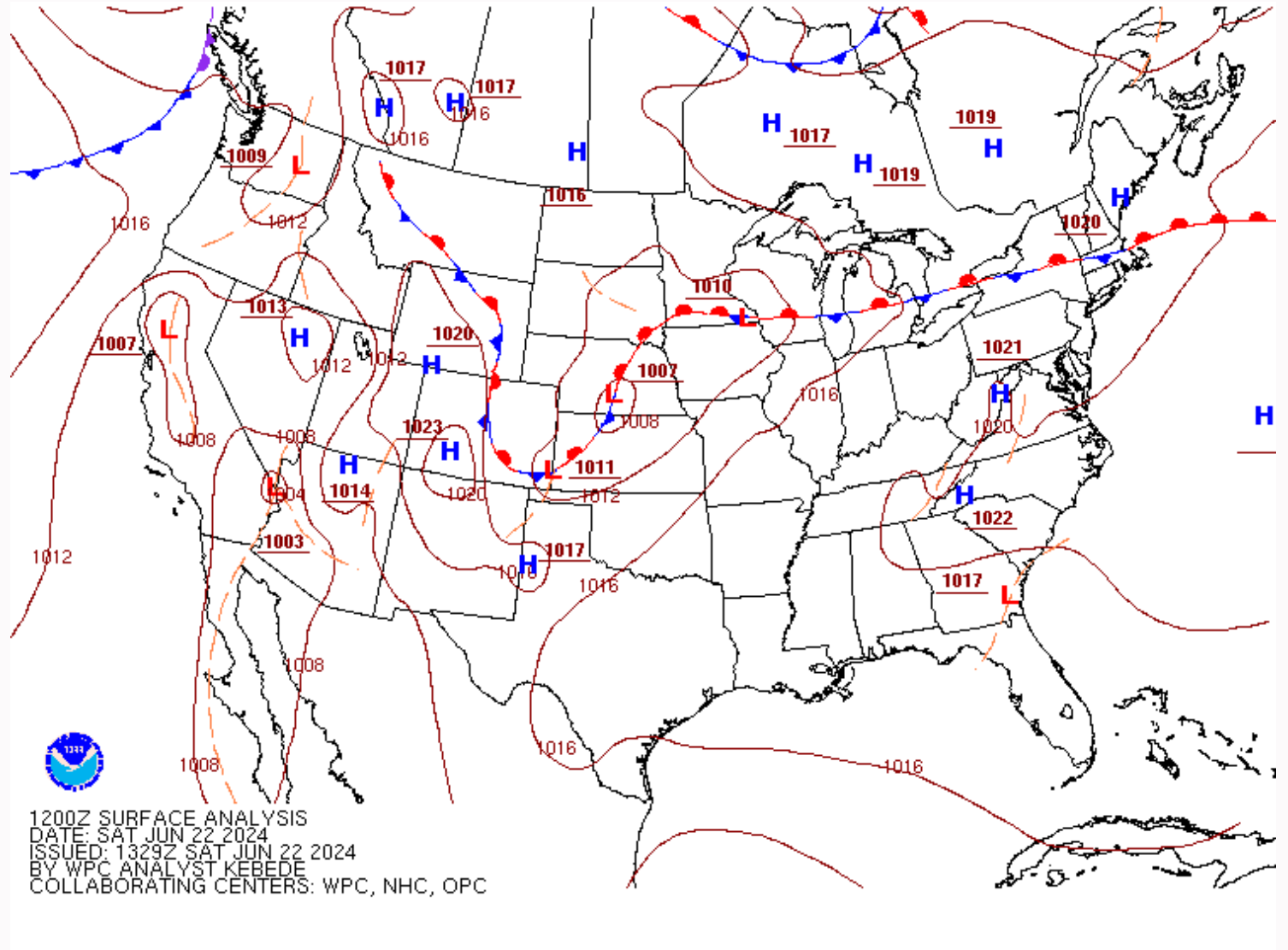
Ozone Episode – June 21, 2024 (Surface Map)





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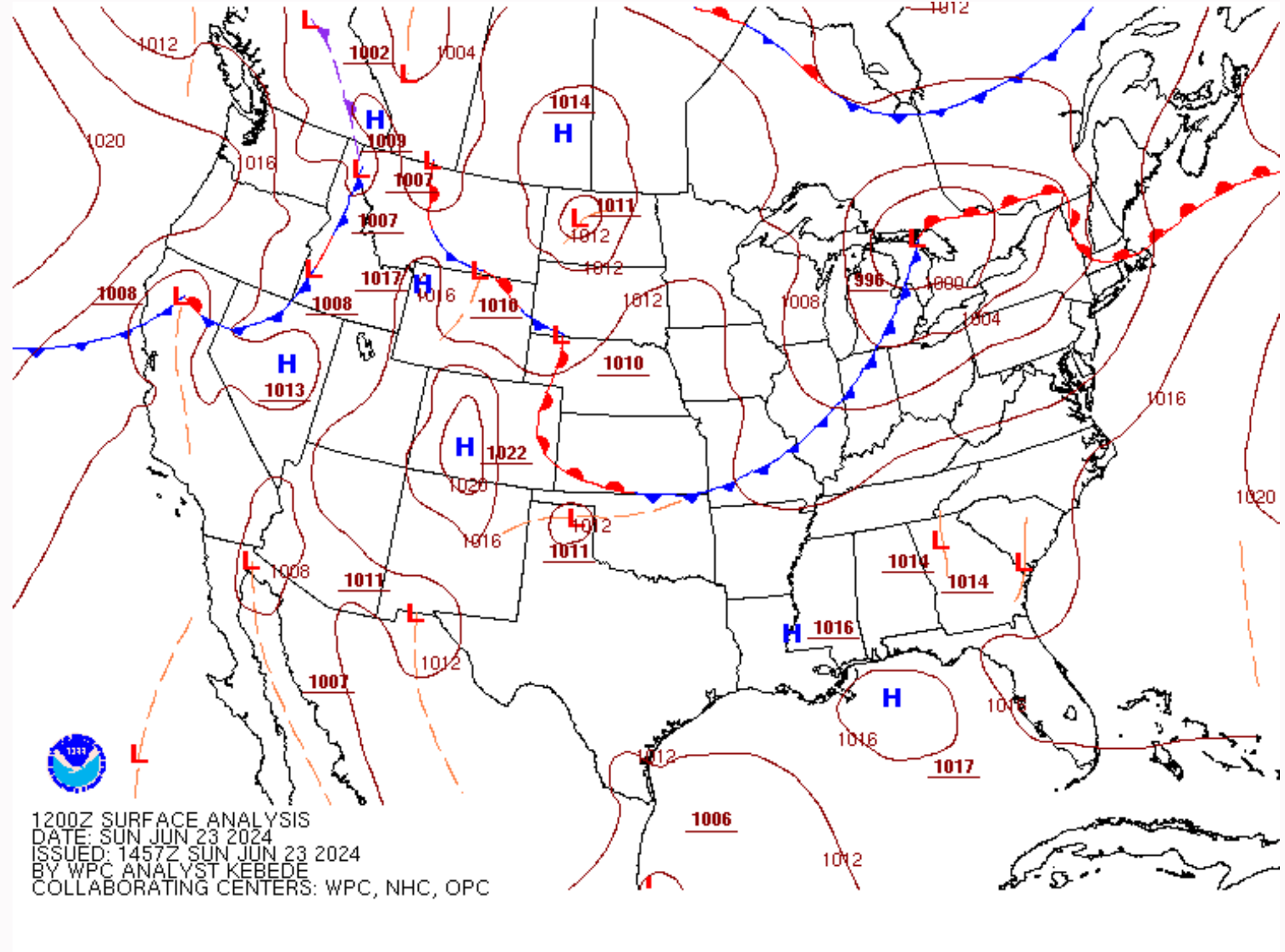
Ozone Episode – June 22, 2024 (Surface Map)





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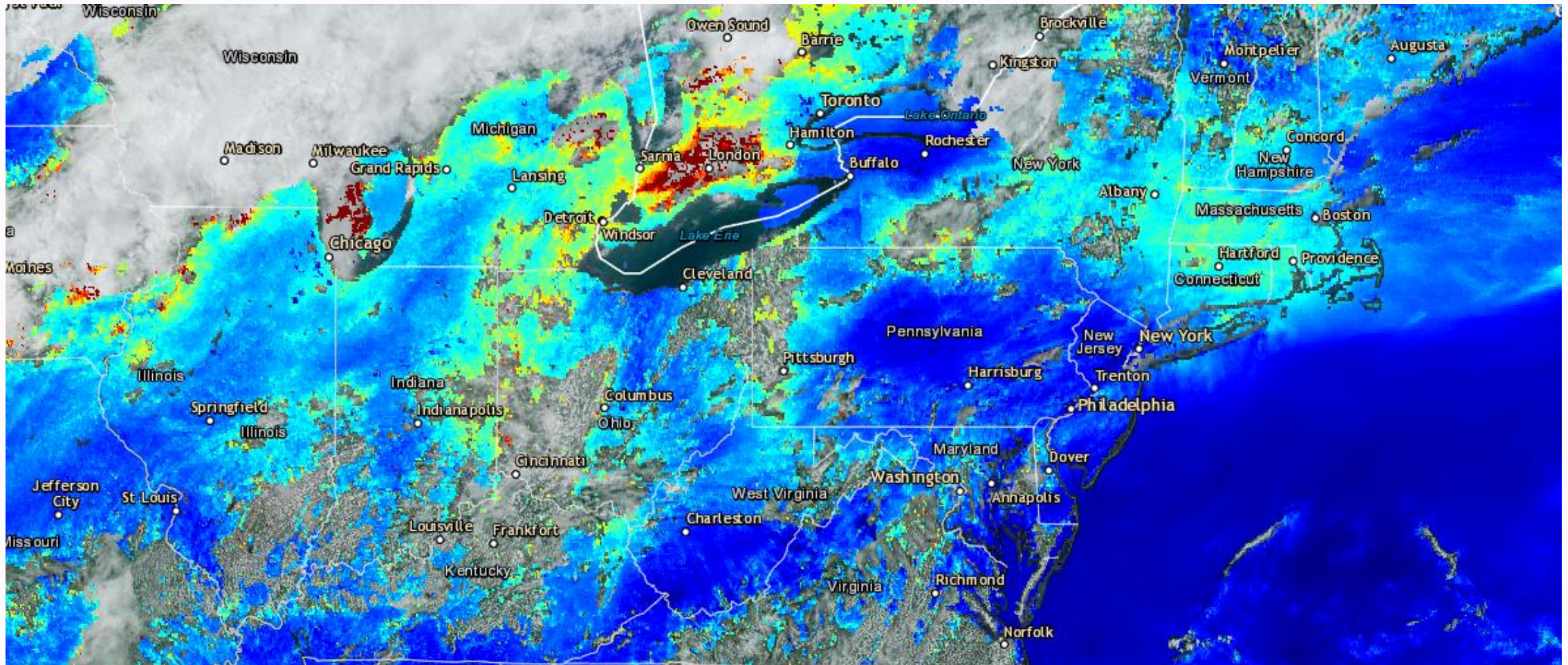
Ozone Episode – June 23, 2024 (Surface Map)





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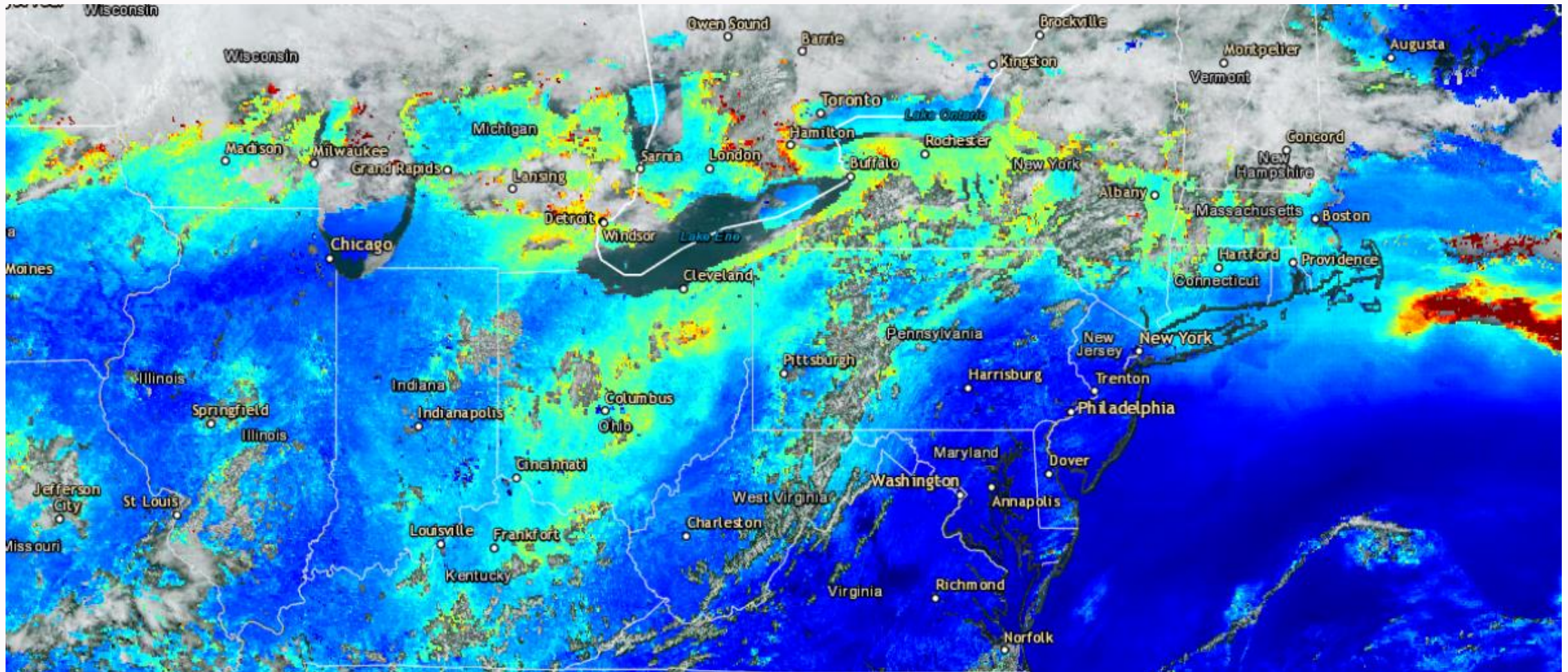
Ozone Episode – June 20, 2024 (Aerosol Optical Depth Map)





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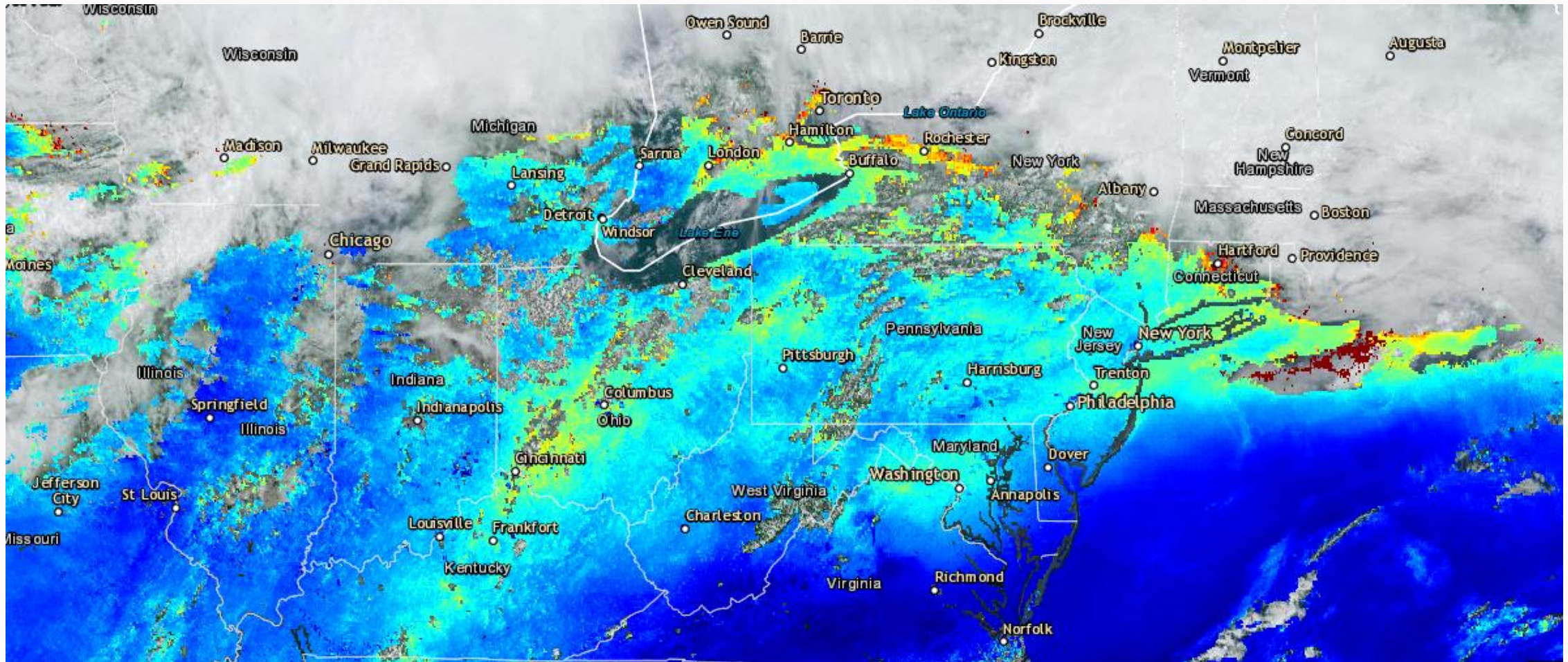
Ozone Episode – June 21, 2024 (Aerosol Optical Depth Map)





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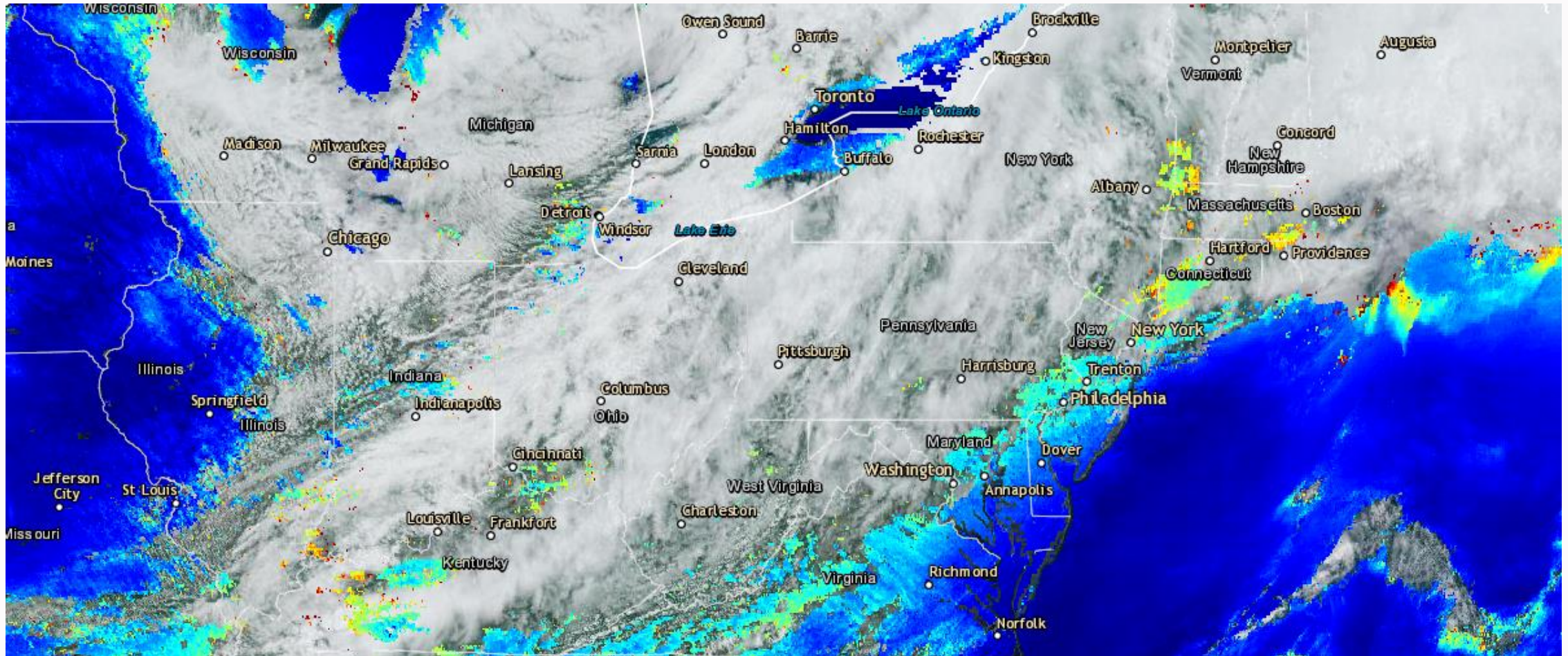
Ozone Episode – June 22, 2024 (Aerosol Optical Depth Map)





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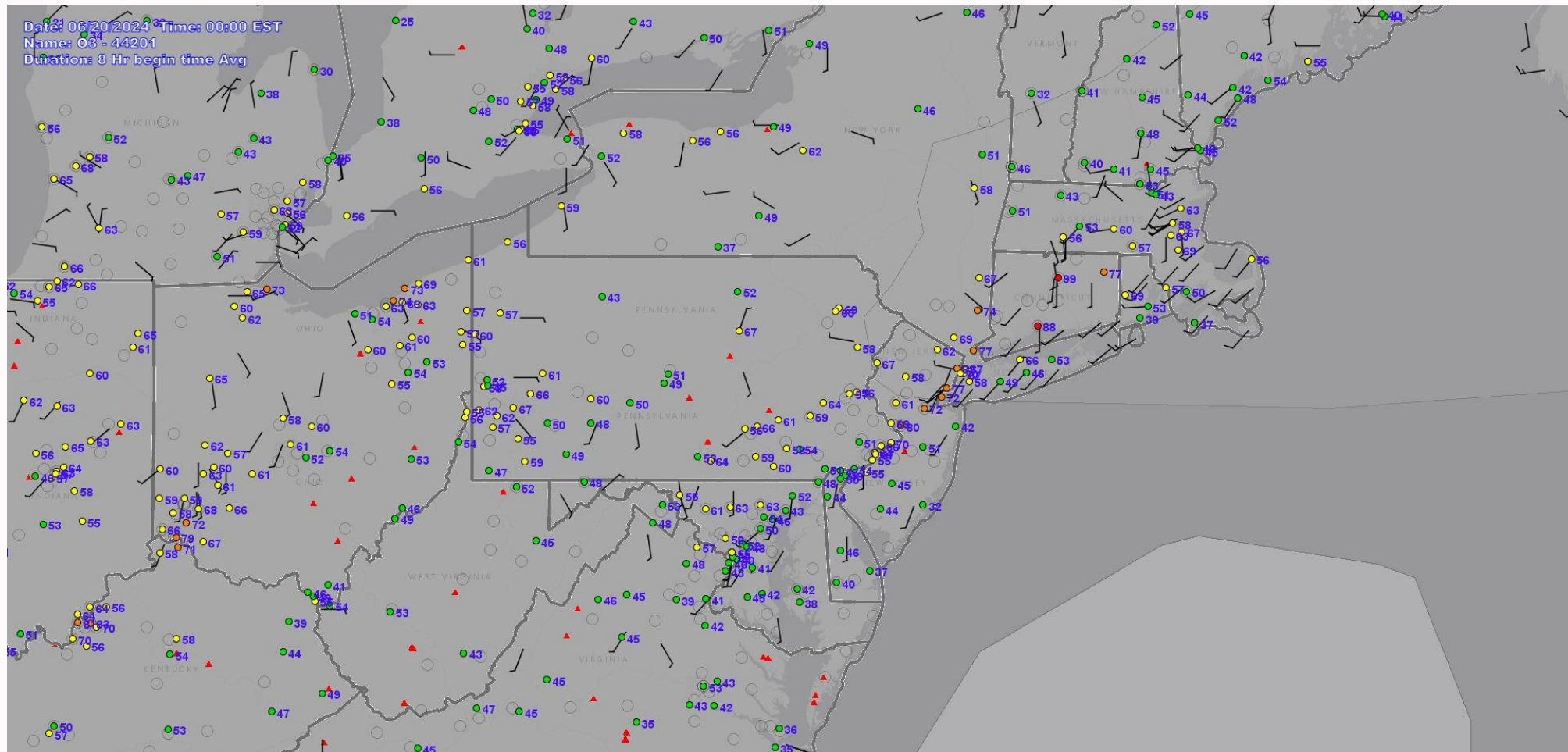
Ozone Episode – June 23, 2024 (Aerosol Optical Depth Map)





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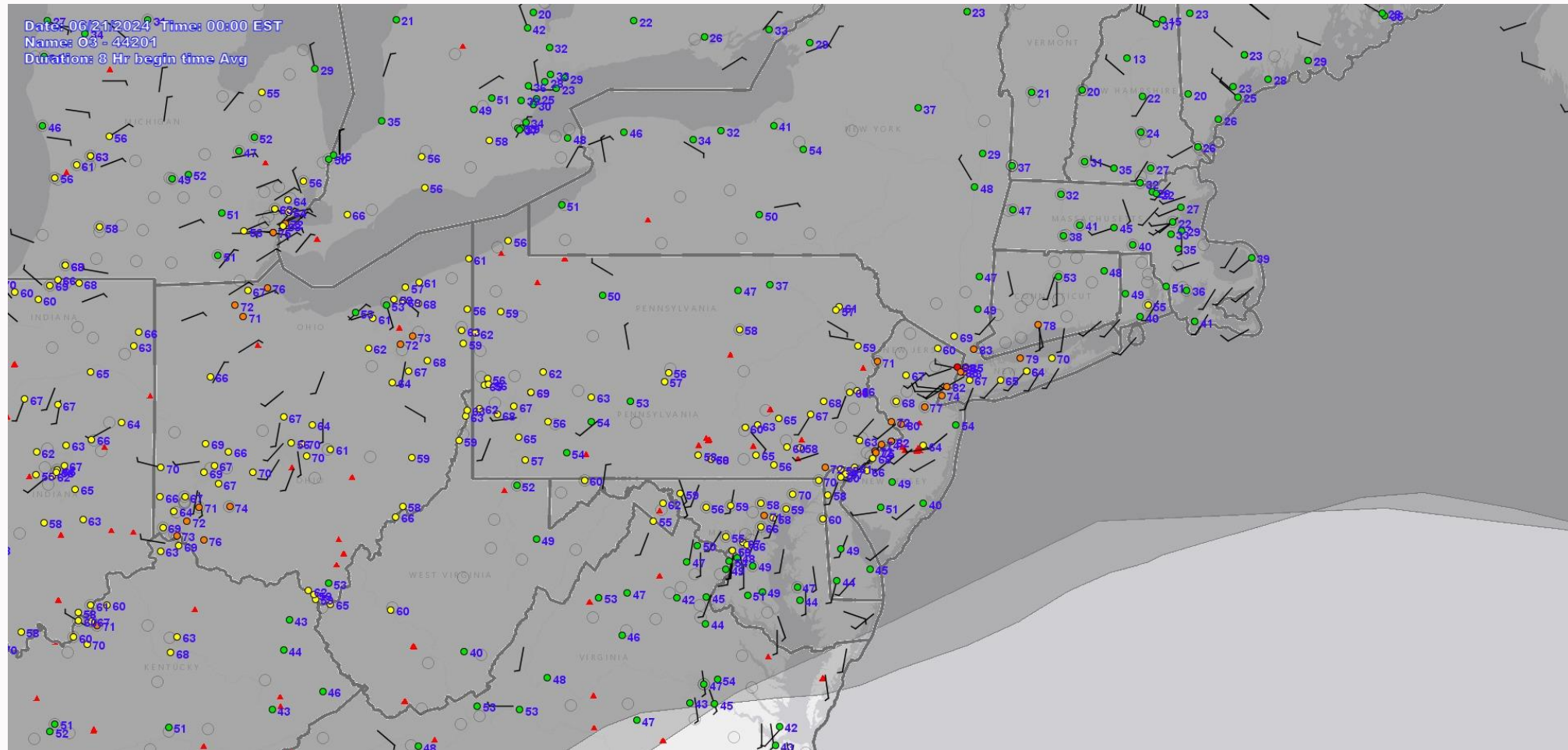
Ozone Episode – June 20, 2024 [Ozone Concentrations Map]





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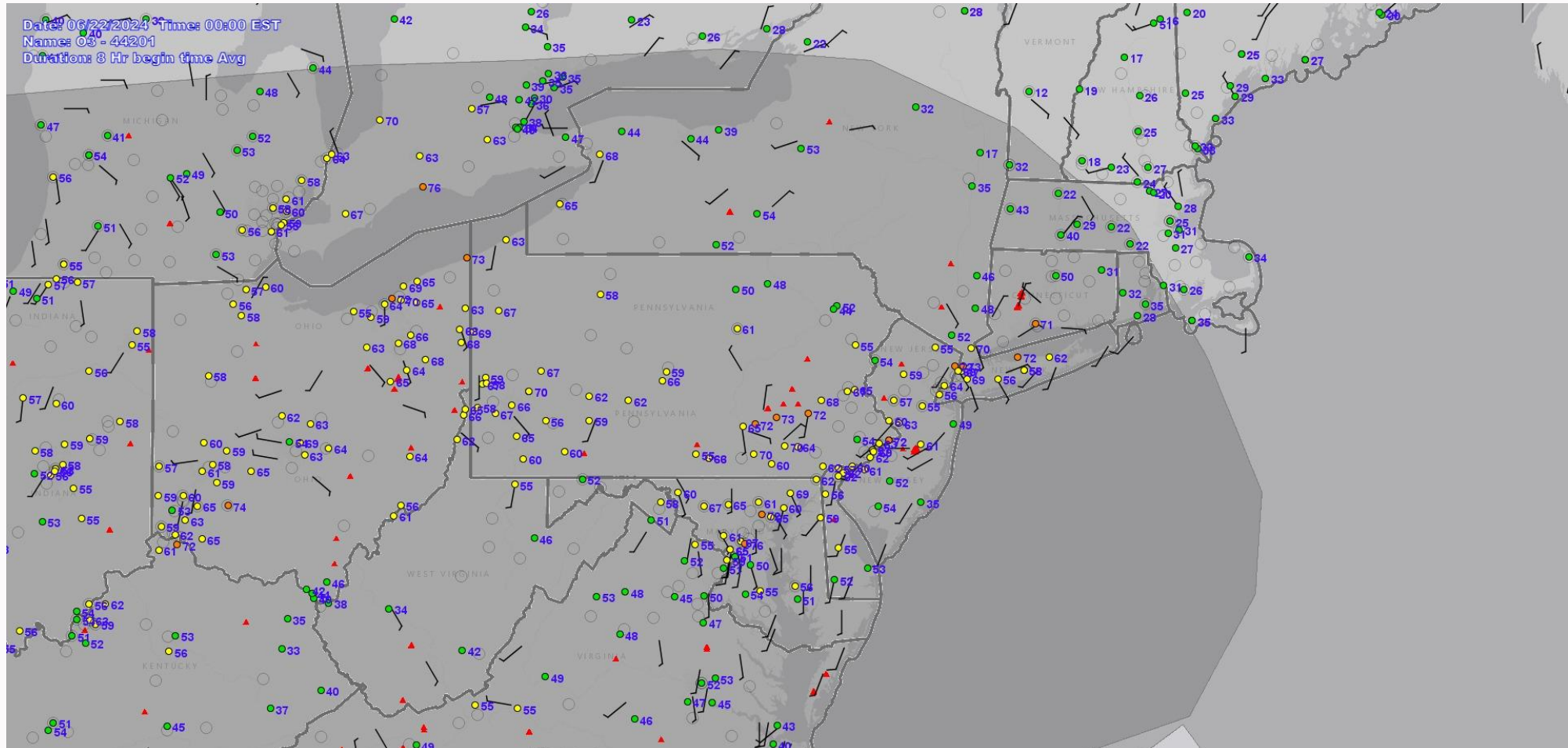
Ozone Episode – June 21, 2024 [Ozone Concentrations Map]





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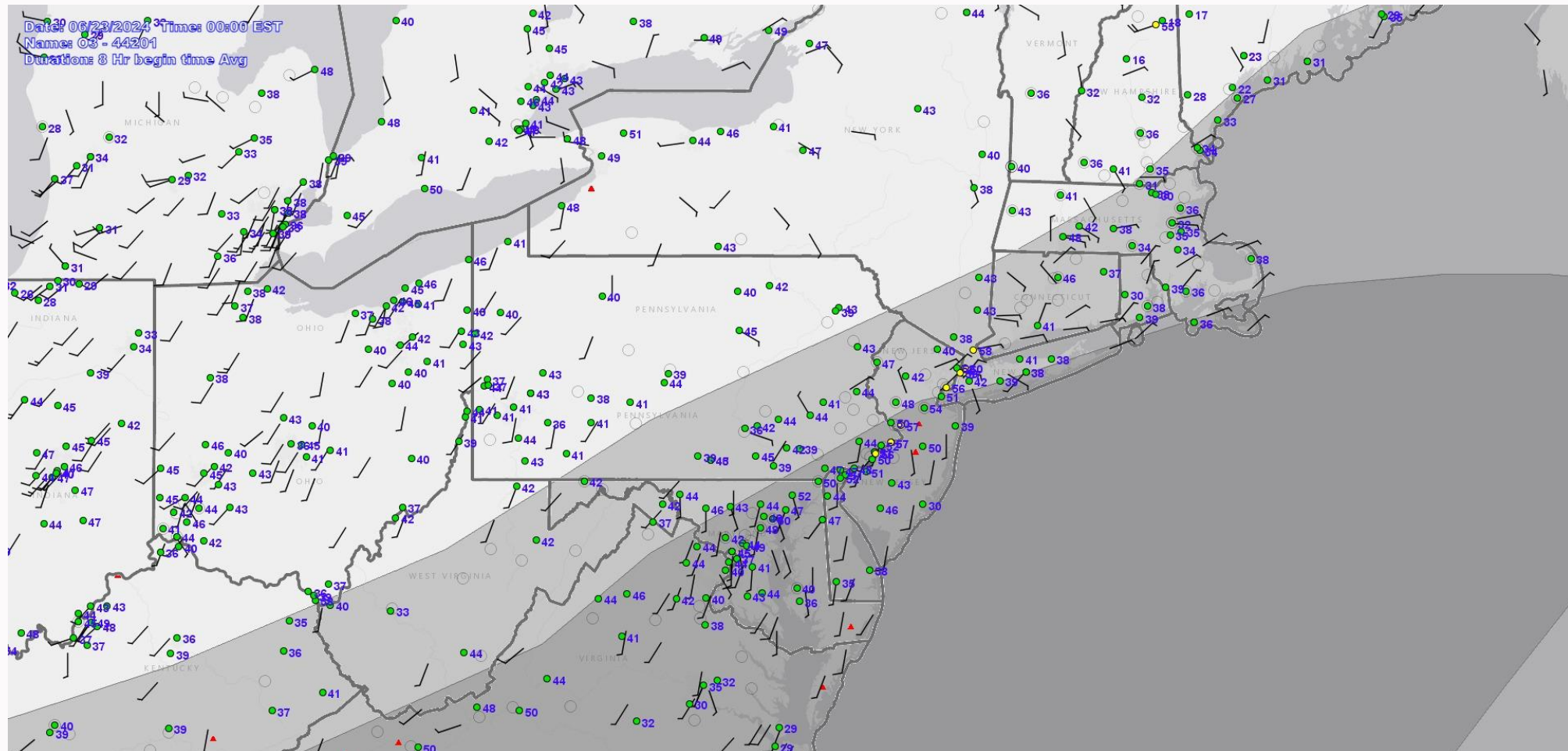
Ozone Episode – June 22, 2024 [Ozone Concentrations Map]





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Ozone Episode – June 23, 2024 [Ozone Concentrations Map]





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Forecasting Air Quality



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Forecasting Air Quality



Photo: Donora, Pennsylvania –

<https://www.nationalgeographic.com/history/article/decades-ago-donora-smog-disaster-exposed-perils-dirty-air>

- The purpose – to inform the public of potential poor air quality.
- Air quality forecasts are completed for PM2.5 year-round and during peak ozone season from mid-April to mid-September.
- PA DEP forecasts using the Air Quality Index scale as the metric.



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What is the Air Quality Index?

AQI Basics for Ozone and Particle Pollution			
Daily AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 - 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 - 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 - 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 - 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 - 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.



What is the Air Quality Index?

AQI Range	1hr Ozone (ppm)	8hr Ozone (ppm)	24hr PM-2.5 ($\mu\text{g}/\text{m}^3$)	8hr Carbon Monoxide (ppm)	1hr Sulfur Dioxide (ppm)	24hr Sulfur Dioxide (ppm)	1hr Nitrogen Dioxide (ppm)	24hr PM-10 ($\mu\text{g}/\text{m}^3$)
0 - 50	Not Defined	0 - 0.054	0 - 9.0	0 - 4.4	0 - 0.035	Not Defined	0 - 0.053	0 - 54
51 - 100	Not Defined	0.055 - 0.070	9.1 - 35.4	4.5 - 9.4	0.036 - 0.075	Not Defined	0.054 - 0.1	55 - 154
101 - 150	0.125 - 0.164	0.071 - 0.085	35.5 - 55.4	9.5 - 12.4	0.076 - 0.185	Not Defined	0.101 - 0.36	155 - 254
151 - 200	0.165 - 0.204	0.086 - 0.105	55.5 - 125.4	12.5 - 15.4	0.186 - 0.304	Not Defined	0.361 - 0.64	255 - 354
201 - 300	0.205 - 0.404	0.106 - 0.200	125.5 - 225.4	15.5 - 30.4	Not Defined	0.305 - 0.604	0.65 - 1.24	355 - 424
301 - 400	0.405 - 0.504	0.201 to SHL*	225.5 - 350.4	30.5 - 40.4	Not Defined	0.605 - 0.804	1.25 - 1.64	425 - 504
401 - 500	0.505 - 0.604	Not Defined	350.5 - 500.4	40.5 - 50.4	Not Defined	0.805 - 1.004	1.65 - 2.04	505 - 604
500+	Not Defined	Not Defined	500.5 - 999.9	Not Defined	Not Defined	Not Defined	Not Defined	605 - 4999

**Forecast
Action Days
when we
feel
conditions
will reach
Code
ORANGE or
higher**

*The SHL (Significant Harm Level) for ozone is 600 ppb, two-hour average **Currently Forecast for Ozone and PM2.5**

Air Quality Forecasting in PA

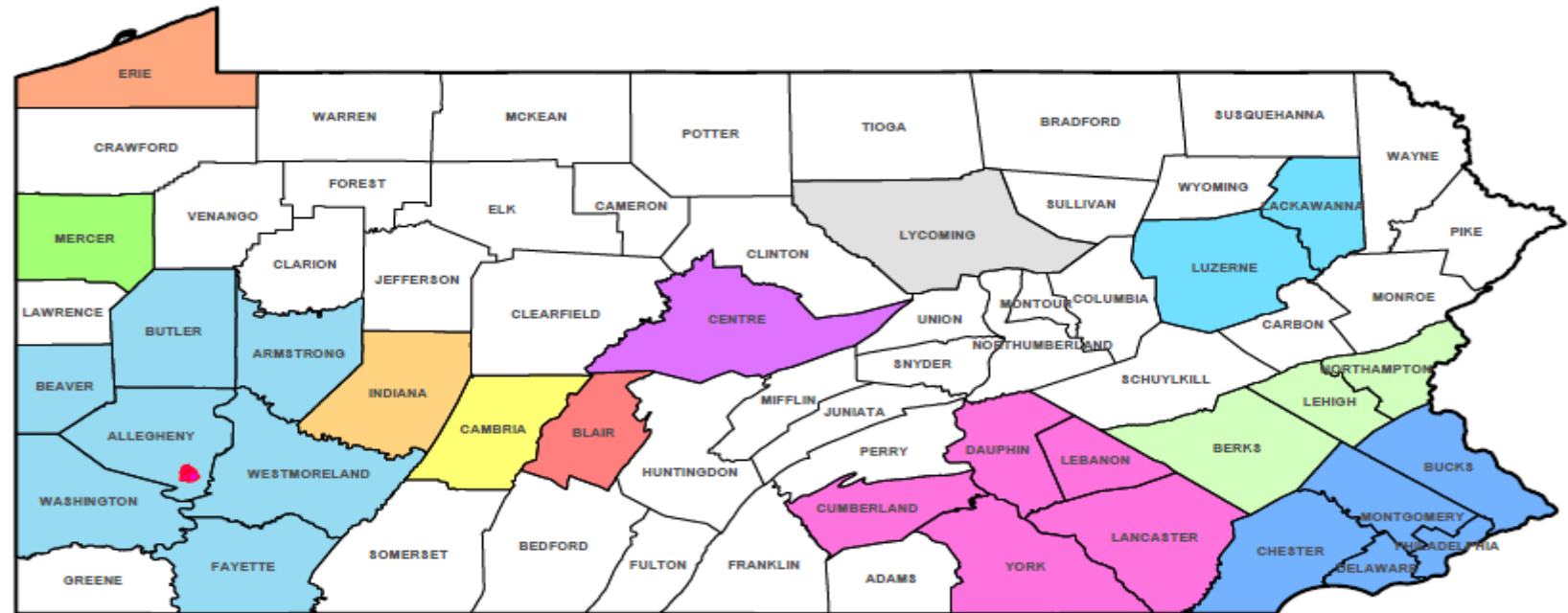
- The PA DEP provides daily air quality forecasts for areas across the Commonwealth.
- The forecasts are generally issued by 3 PM daily... giving insight about what weather factors cause the forecasted air quality conditions.
- To sign up for the forecast, go to <http://www.enviroflash.info>.
- Other places to see the air quality forecast:
 - EPA Airnow website (<https://www.airnow.gov>)
 - Local and national news outlets



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Where does PA DEP forecast?

PA DEP forecasts for 13
regions across the
Commonwealth



Air Quality Forecast Areas

Altoona	Lehigh Valley / Berks Area	Southeast (Philadelphia Area)	Susquehanna Valley
Erie	Mercer County	Southwest (Pittsburgh Area)	Williamsport
Indiana County	Scranton / Wilkes-Barre	State College	Liberty-Clairton
Johnstown			



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How are Ozone Exceedances shared with the public?

Daily Maximum Ozone Summary Report

June 4, 2024

Monitoring Site Information Site Name	County	Max 1-Hour (ppb)	Hour (EST)	Max 8-Hour (ppb)	AQI	Hour (EST)
PA DEP Monitors						
<i>Southeastern Pennsylvania</i>						
Bristol	Bucks	64	9	62	74	8
New Garden (Airport)	Chester	72	10	63	77	8
Chester	Delaware	68	9	58	61	8
Norristown	Montgomery	71	10	64	80	8
<i>Northeastern Pennsylvania</i>						
Peckville	Lackawanna	69	16	64	80	11
Scranton	Lackawanna	64	16	59	64	10
Allentown	Lehigh	62	13	59	64	9
Swiftwater	Monroe	84	15	76	119	10
Freemansburg	Northampton	66	11	62	74	9
<i>Southcentral Pennsylvania</i>						
Arendtsville	Adams					
Kutztown	Berks	79	13	71	101	10
Reading Airport	Berks	78	13	70	100	10
Altoona	Blair	48	18	44	41	10
Harrisburg	Dauphin	77	14	70	100	10
Hershey	Dauphin	78	13	72	105	10
Methodist Hill	Franklin					
Lancaster	Lancaster	75	14	68	93	10
Lancaster DW	Lancaster	77	12	72	105	9
Lebanon	Lebanon	77	15	73	108	10
York	York	69	11	67	90	10
York DW	York					
<i>Northcentral Pennsylvania</i>						
Towanda	Bradford	64	14	62	74	10
State College	Centre	76	20	68	93	18
Montoursville	Lycoming	73	17	68	93	12
Tioga County	Tioga	69	22	65	84	16
<i>Southwestern Pennsylvania</i>						
Beaver Falls	Beaver	61	13	50	46	10
Brighton Twp	Beaver	64	12	52	48	9
Fort McIntosh	Beaver	60	13	49	45	9
Uniontown	Fayette	44	13	39	36	10
Johnstown	Cambria	48	17	44	41	10
Holbrook	Greene	49	14	43	40	10
Charleroi	Washington	42	13	38	35	9
Florence	Washington	52	11	48	44	9
Houston	Washington					
Greensburg	Westmoreland	40	13	36	33	8

Source - http://www.ahs2.dep.state.pa.us/aq_apps/ozone/summary.htm



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How are Ozone Exceedances shared with the public?

Monitoring Site Information Site Name County		Totals		6/21/2024		6/22/2024		6/26/2024		7/7/2024	
		Hr NAAQS >70	Hr NAAQS >75	Max	Hour	Max	Hour	Max	Hour	Max	Hour
PA DEP Monitors											
<i>Southeastern Pennsylvania</i>											
Bristol	Bucks	10	4	82	11	72	10	85	11	71	10
New Garden (Airport)	Chester	3	2	72	11			76	11		
Chester	Delaware	2	1					73	10		
Norristown	Montgomery	1	1								
<i>Northeastern Pennsylvania</i>											
Peckville	Lackawanna	0	0								
Scranton	Lackawanna	0	0								
Allentown	Lehigh	2	1								
Swiftwater	Monroe	1	1								
Freemansburg	Northampton	1	0								
<i>Southcentral Pennsylvania</i>											
Arendtsville	Adams	0	0								
Kutztown	Berks	1	0								
Reading Airport	Berks	1	0			72	10				
Altoona	Blair	0	0								
Harrisburg	Dauphin	0	0								
Hershey	Dauphin	2	0			72	9				
Methodist Hill	Franklin	0	0								
Lancaster	Lancaster	0	0								
Lancaster DW	Lancaster	1	0								
Lebanon	Lebanon	2	0			73	9				
York	York	1	0								
York DW	York	0	0								

Source - http://www.ahs2.dep.state.pa.us/aq_apps/ozone/summary.htm



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Get In Touch

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The Department of Environmental Protection's mission is to protect Pennsylvania's air, land and water resources and to provide for the health and safety of its residents and visitors, consistent with the rights and duties established under the Environmental Rights Amendment (Article 1, Section 27 of the Pennsylvania Constitution).