Ozone National Ambient Air Quality Standard Health Exceedances on June 5, 2021

Exceedance Locations and Levels

On Saturday, June 5, 2021, there were four (4) exceedances in New Jersey of the National Ambient Air Quality Standard (NAAQS) for ozone (daily maximum 8-hour average of 70 ppb). See Table 1.

Table 1. New Jersey Ozone Concentrations on 6/5/2021

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	67
Bayonne	66
Brigantine	55
Camden Spruce St	68
Chester	67
Clarksboro	70
Colliers Mills	78
Columbia	62
Flemington	66
Leonia	76
Millville	71
Monmouth University	71
Newark Firehouse	66
Ramapo	61
Rider University	70
Rutgers University	68
Washington Crossing*	67
TOTAL EXCEEDANCES	4

*The Washington Crossing station is operated and maintained by EPA as part of the nationwide Clean Air Status and Trends Network (CASTNET).

From the out-of-state stations within New Jersey's ozone nonattainment areas, there were nineteen (19) exceedances of the ozone NAAQS. See Table 2.

Table 2. Ozone Concentrations at Out-of-State Monitoring Stations in New Jersey's Ozone Nonattainment Areas on 6/5/2021

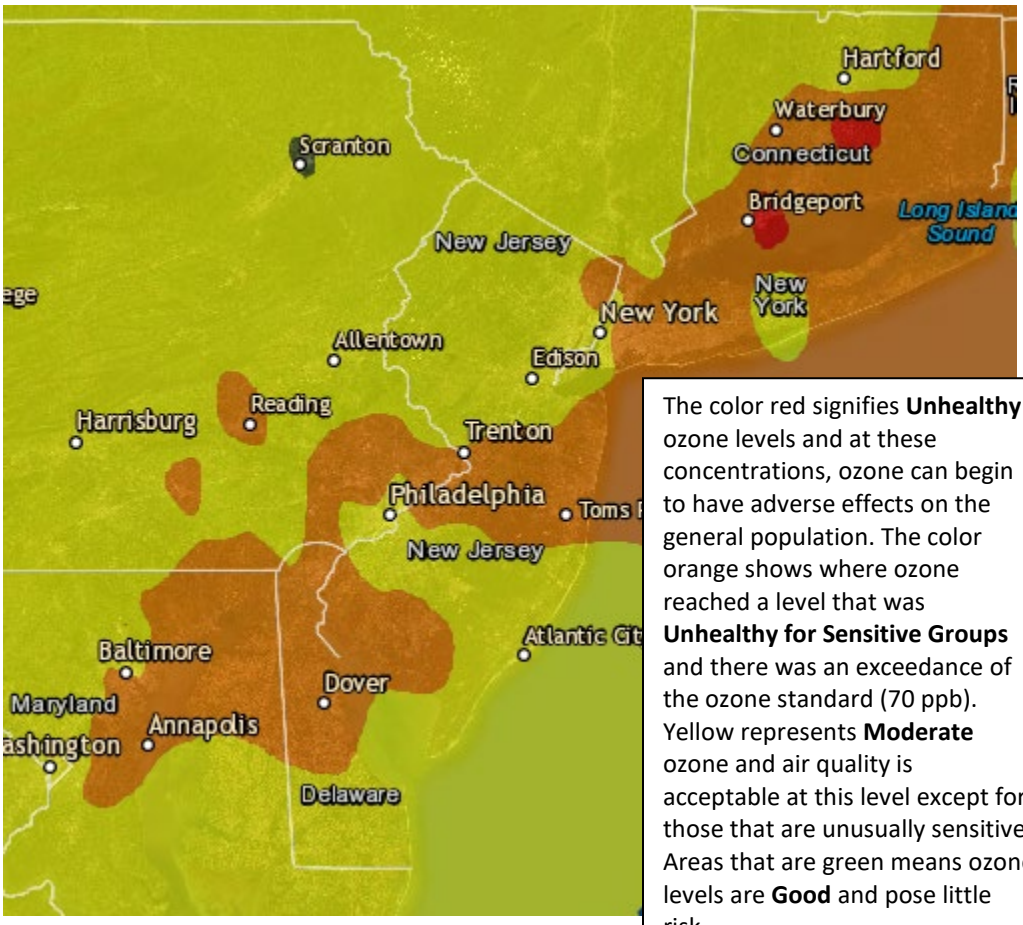
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	63
CT	Greenwich	71
CT	Madison-Beach Road	83
CT	Middletown-CVH-Shed	86
CT	New Haven	76
CT	Stratford	86
CT	Westport	80
DE	BCSP (New Castle Co.)	72
DE	BELLFNT2 (New Castle Co.)	73
DE	KILLENS (Kent Co.)	73
DE	LEWES (Sussex Co.)	62
DE	LUMS 2 (New Castle Co.)	70
DE	MLK (New Castle Co.)	74
DE	SEAFORD (Sussex Co.)	64
MD	Fair Hill	75
NY	Babylon	74
NY	Bronx - IS52	70
NY	CCNY	67
NY	Fresh Kills	No Data
NY	Holtsville	69
NY	Pfizer Lab	71
NY	Queens	78
NY	Riverhead	73
NY	Rockland Cty	58
NY	White Plains	67
PA	BRIS (Bucks Co.)	73
PA	CHES (Delaware Co.)	67
PA	NEWG (Chester Co.)	65
PA	NORR (Montgomery Co.)	74
PA	LAB (Philadelphia Co.)	68
PA	NEA (Philadelphia Co.)	72
PA	NEW (Philadelphia Co.)	73
	TOTAL EXCEEDANCES	19

The number of days in 2021 on which exceedances of the ozone NAAQS were recorded for all the states within New Jersey's ozone nonattainment areas is summarized in Table 3.

Table 3. Number of Days Ozone NAAQS was Exceeded in NJ's Nonattainment Areas in 2021

STATE	# of Days NAAQS was Exceeded January 1 – June 5, 2021 NAAQS = 70 ppb
Connecticut	2
Delaware	2
Maryland	2
New Jersey	3
New York	1
Pennsylvania	2

Figure 1. Ozone Air Quality Index for June 5, 2021



The color red signifies **Unhealthy** ozone levels and at these concentrations, ozone can begin to have adverse effects on the general population. The color orange shows where ozone reached a level that was **Unhealthy for Sensitive Groups** and there was an exceedance of the ozone standard (70 ppb). Yellow represents **Moderate** ozone and air quality is acceptable at this level except for those that are unusually sensitive. Areas that are green means ozone levels are **Good** and pose little risk.

Source: www.airnow.gov

For ozone terminology definitions see NJDEP Air Quality Planning's Glossary and Acronyms webpage: http://nj.gov/dep/baqp/glossary.html

Weather

High pressure strengthened over the eastern United States on Saturday June 5, 2021 after a week of cloud cover and intermittent rain showers. Favorable meteorological conditions for ozone formation and the combination of regional transport of emissions and long-range transport of previously polluted air from the Great Lakes region, allowed for a quick rise in ozone levels across the northeastern United States. The nonattainment area observed several exceedances on this day as locations along the I-95 corridor as well as portions of central New Jersey and Long Island reached the unhealthy for sensitive groups (USG) category with isolated locations along the Connecticut coastline recording unhealthy levels.

High pressure established itself over the eastern half of the United States on Saturday allowing for favorable weather conditions for ozone formation throughout the nonattainment area. Abundant sunshine and rising temperatures were observed while southwesterly winds allowed for the localized transport of emissions from cars, trucks, and industry along the I-95 corridor. Additionally, a surface trough was noted over the region, extending from New England southwest through the Northern NJ / NYC metropolitan area, portions of New Jersey, and into the Mid-Atlantic region. The presence of this weather feature allowed for vertical motion in the atmosphere mixing previously polluted air from the Great Lakes region toward the surface, further enhancing ozone levels.

The widespread ozone exceedances noted in the nonattainment area can be attributed to favorable weather conditions for ozone formation as well as the combination of localized transport of emissions along the I-95 corridor and long-range transport of previously polluted air from the Great Lakes region.

Where Did the Air Pollution that Caused Ozone Come From?

Figures 2, 3, and 4 show the back trajectories starting at different wind heights for the monitored exceedances on June 5, 2021. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Ten monitoring stations were chosen to model back trajectories and are listed in Table 4.

Table 4. Monitoring Stations with an 8-hr Ozone Exceedance that were selected to Run 48-hr Back Trajectories

STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Middletown	86
CT	Stratford	86
CT	Madison-Beach Road	83
NY	Babylon	74
NY	Queens	78
NJ	Colliers Mills	78
NJ	Millville	71

NJ	Monmouth University	71
DE	MLK BLVD	74
MD	Fair Hill	75

Back trajectories from June 5th show that exceedances observed across the nonattainment area were highly influenced by favorable weather conditions mentioned above, as well as an established high-pressure center driving long range transport from the west. This set up allowed for localized transport at the surface of emissions along the I-95 corridor and long-range transport of ozone from the mid-west. This combination allowed ozone levels to quicky rise leading to widespread ozone exceedances on this day.

The surface level back trajectories (Figure 2) show that air at the surface originated mainly in Virginia and followed a northeasterly trajectory along the I-95 corridor. While traveling over this area, trajectories passed over the Washington D.C. and Chesapeake Bay areas, and the Philadelphia and New York City metropolitan centers before reaching their destinations. Additionally, trajectories traveling into Connecticut passed over Long Island and the Sound where peaking units may have been operating on this day. This may be a contributing factor explaining why Connecticut observed much higher ozone values on June 5th than nearby states. While traveling along at ground level, trajectories likely picked up emissions from cars, trucks, and local industry while growing increasingly polluted along the way.

Mid and upper level back trajectories (Figures 3 & 4) followed similar transport pathways. Aloft, these trajectories originated in the Mid-West and traveled generally in an easterly direction while passing over many states during transit. Along this route, mid and upper level trajectories passed over parts of the heavily populated and industrialized Great Lakes Region where widespread moderate and isolated unhealthy for sensitive groups (USG) air quality was observed the previous day. Under the influence of persistent high pressure as well as the presence of a surface trough, air at both levels made a descent to lower elevations which may have provided an opportunity for polluted air aloft to mix down to the surface.

Figure 5 shows the National Air Quality Index observed on June 4th, the day prior to this exceedance event. As shown in the figure, widespread moderate and isolated areas of USG ozone levels were observed over the Ohio River Valley and Great Lakes regions. The localized and regional transport of ozone precursors in the upper atmosphere, in combination with the favorable meteorological conditions mentioned previously, helped lead to widespread exceedances across the nonattainment area.

Figure 2. 48-hour Back Trajectories for June 5, 2021 at 10 meters

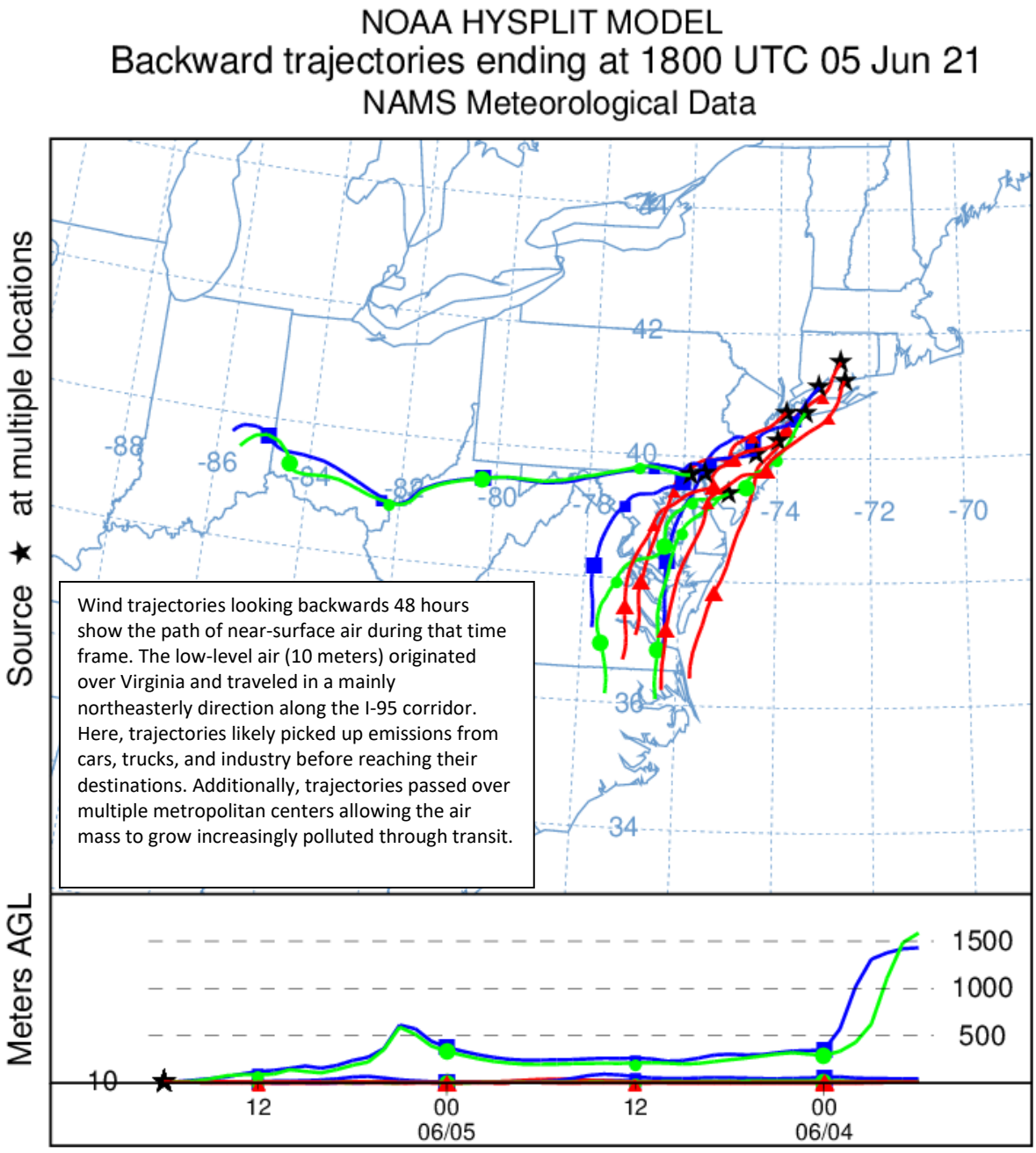


Figure 3. 48-hour Back Trajectories for June 5, 2021 at 500 meters

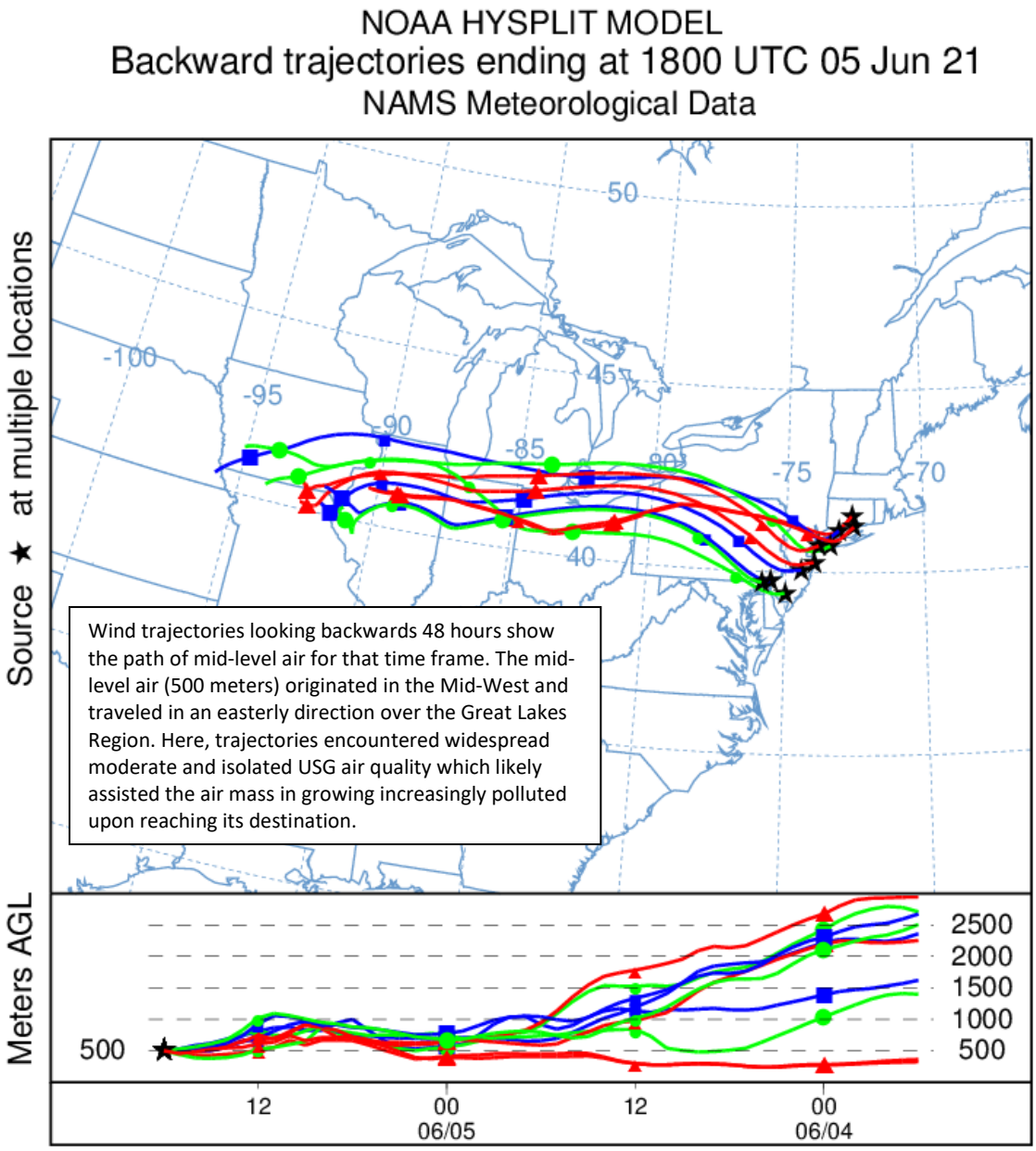


Figure 4. 48-hour Back Trajectories for June 5, 2021 at 1500 meters

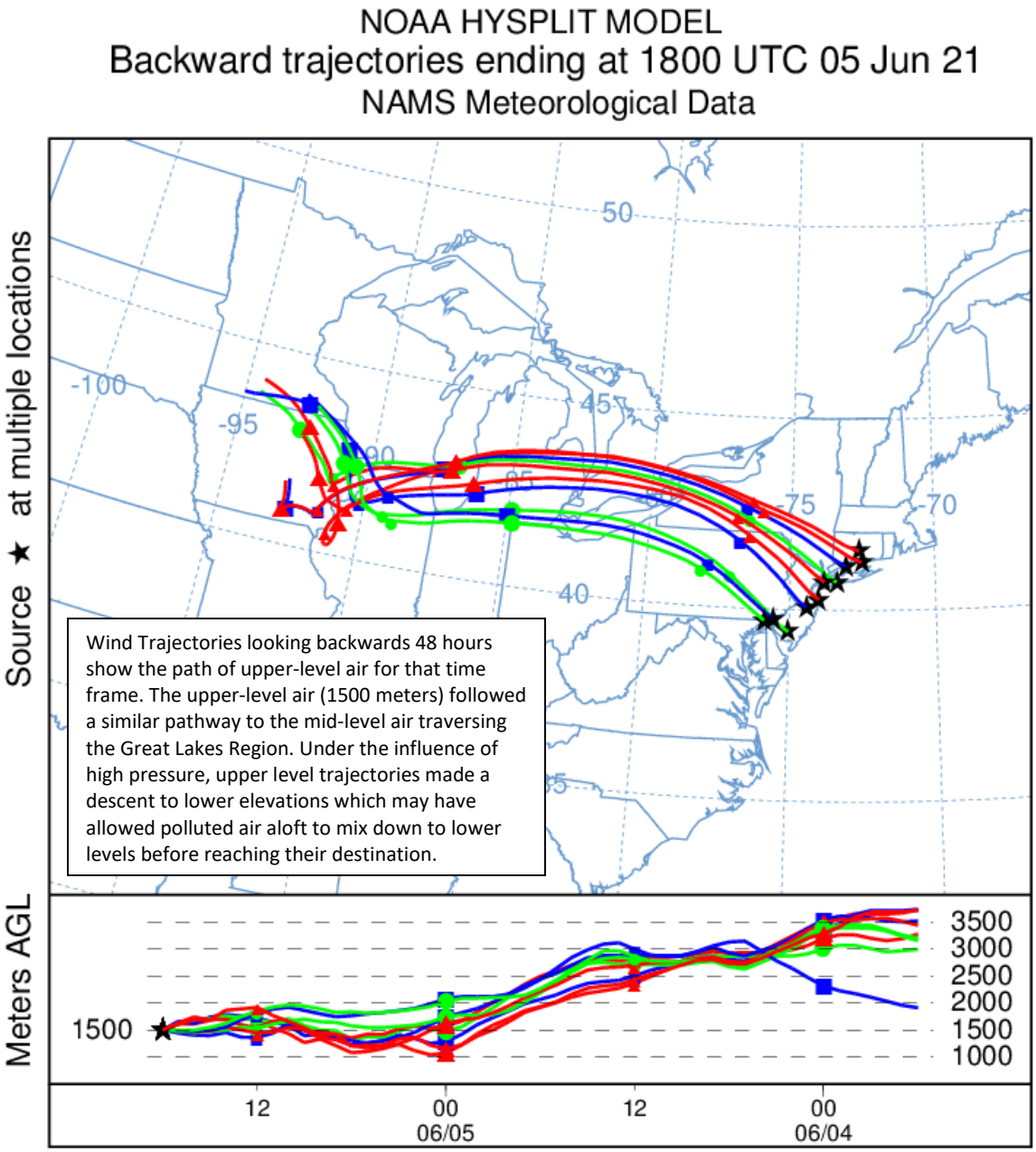
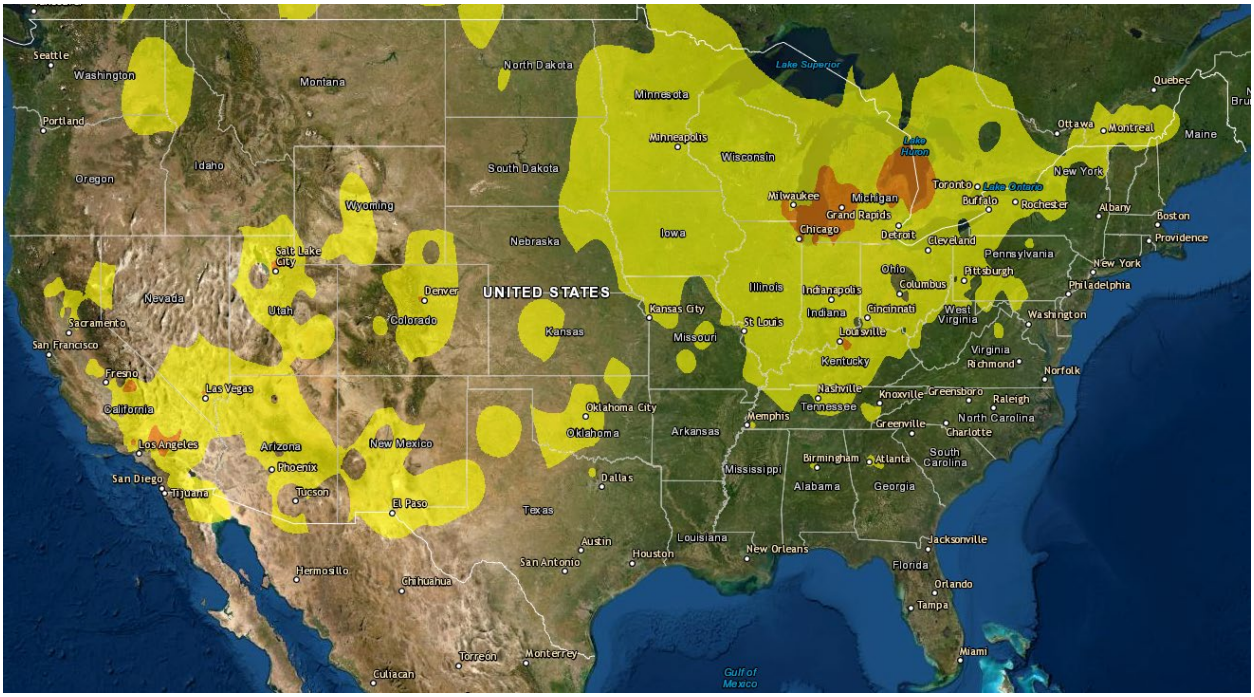


Figure 5. Combined Air Quality Index for the United States on June 4, 2021



Source: www.airnow.gov

How is Ozone Created?

Ground-level ozone is an air pollutant known to cause several health effects and negatively impact air quality and the environment in New Jersey. Ozone is formed when oxides of nitrogen (NOx) and volatile organic compounds (VOCs) react in the presence of sunlight. Ozone can irritate any person's lungs, but the effect may be more pronounced for those with existing lung-related deficiencies, and therefore, one should take extra precautions on bad ozone days.

Find Out About Air Quality Every Day

Learn more about your local ozone air quality forecast by visiting the "What's Your Air Quality Today?" page at http://www.nj.gov/dep/cleanairnj/ .