Ozone National Ambient Air Quality Standard Health Exceedances on August 6, 2021

On Friday, August 6, 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. A table listing all the ozone exceedances for 2021 in New Jersey may be found at https://www.nj.gov/dep/airmon/pdf/2021-nj-aqi-exceedence-days.pdf.

Table 1. New Jersey Ozone Concentrations on 8/6/2021

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	61
Bayonne	70
Brigantine	58
Camden Spruce St	64
Chester	63
Clarksboro	62
Colliers Mills	60
Columbia	63
Flemington	68
Leonia	78
Millville	68
Monmouth University	62
Newark Firehouse	63
Ramapo	60
Rider University	79
Rutgers University	79
Washington Crossing*	78
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 thirteen (13) 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 8/6/2021

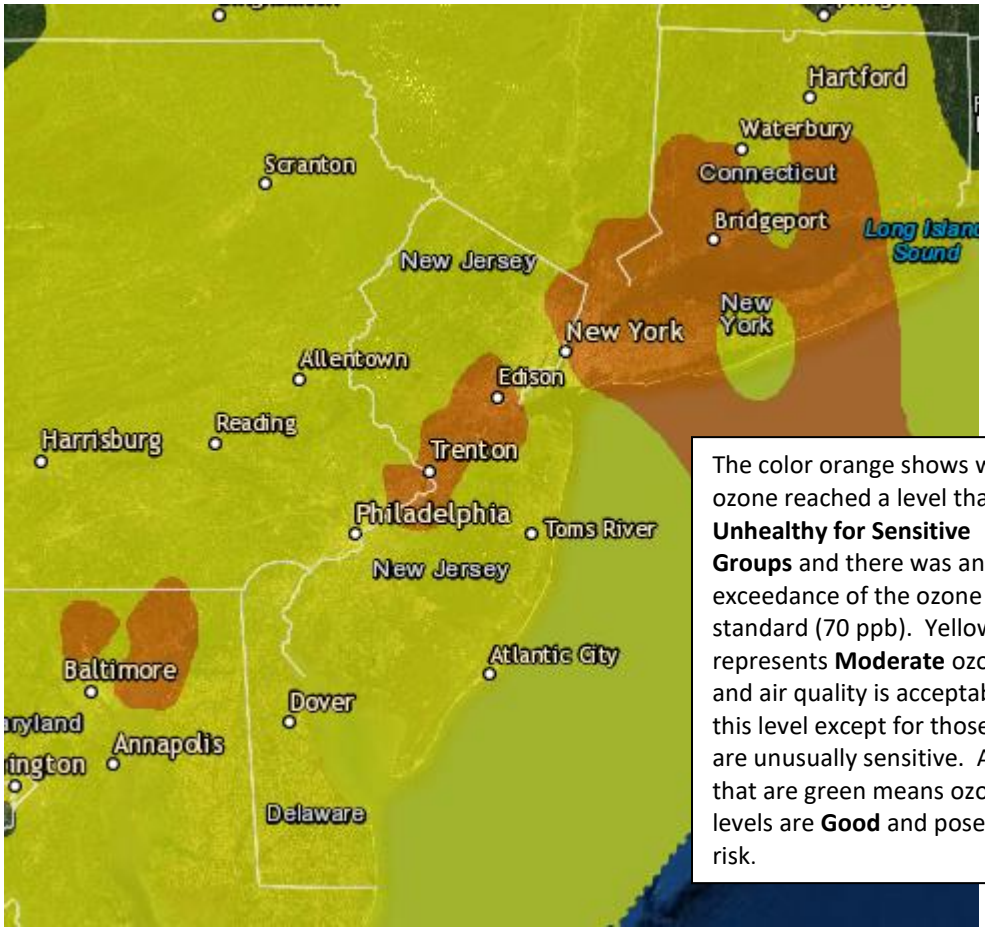
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	72
CT	Greenwich	78
CT	Madison-Beach Road	77
CT	Middletown-CVH-Shed	71
CT	New Haven	67
CT	Stratford	80
CT	Westport	80
DE	BCSP (New Castle Co.)	56
DE	BELLFNT2 (New Castle Co.)	64
DE	KILLENS (Kent Co.)	67
DE	LEWES (Sussex Co.)	63
DE	LUMS 2 (New Castle Co.)	61
DE	MLK (New Castle Co.)	63
DE	SEAFORD (Sussex Co.)	61
MD	Fair Hill	64
NY	Babylon	71
NY	Bronx - IS52	70
NY	CCNY	72
NY	Flax Pond	76
NY	Fresh Kills	67
NY	Holtsville	68
NY	Pfizer Lab	73
NY	Queens	72
NY	Riverhead	70
NY	Rockland Cty	64
NY	White Plains	78
PA	BRIS (Bucks Co.)	73
PA	CHES (Delaware Co.)	64
PA	NEWG (Chester Co.)	59
PA	NORR (Montgomery Co.)	63
PA	LAB (Philadelphia Co.)	68
PA	NEA (Philadelphia Co.)	70
PA	NEW (Philadelphia Co.)	69
	TOTAL EXCEEDANCES	13

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 – August 6, 2021 NAAQS = 70 ppb
Connecticut	14
Delaware	3
Maryland	3
New Jersey	8
New York	12
Pennsylvania	8

Figure 1. Ozone Air Quality Index for August 6, 2021



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 dominated the weather pattern on Friday, August 6th, 2021, as a lingering frontal boundary, just off the coast, pushed further out to sea. This atmospheric setup allowed for favorable weather conditions for ozone formation as well as the local and regional transport of emissions and previously polluted air into the nonattainment area. As a result, several ozone exceedances were observed along the I-95 corridor and throughout portions of the NYC metropolitan area, Long Island, and Connecticut on this day.

High pressure over the Mid-Atlantic region slowly pushed east throughout the day on August 6th. As a result, mostly sunny skies were observed across the nonattainment area while steady south to southwesterly winds at the surface ensured warm temperatures throughout the region. This southwesterly flow also allowed for the transport of emissions from cars, trucks, and industry as well as previously polluted air, from the Chesapeake Bay vicinity, along the I-95 corridor leading to a gradual deterioration of air quality within the nonattainment area. Additionally, a general sinking motion associated with this high-pressure system allowed for any additional emissions or previously polluted air, from points west, to be mixed toward the surface, further enhancing ozone levels.

Multiple ozone exceedances noted along the I-95 corridor and across portions of the northern nonattainment area can be attributed to favorable weather conditions for ozone formation as well as the local and regional transport of emissions and previously polluted air.

Where Did the Air Pollution that Caused Ozone Come From?

Air pollution from human activities including cars, trucks, factories, and power plants is blown by prevailing winds and reacts with sunlight and other ozone precursors to create poor air quality. An analysis of the meteorology and back trajectories from August 6th shows that the exceedances along the I-95 corridor in Pennsylvania, New Jersey, New York, and Connecticut were influenced by high pressure building over the region. This allowed for favorable weather conditions for ozone formation across the region. These conditions, along with the transport of localized and regional emissions, and previously polluted air, led to elevated ozone levels along the I-95 corridor.

Figures 2, 3, and 4 show the back trajectories starting at different wind heights for the monitored exceedances on August 6, 2021. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedance. 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	Greenwich	78
CT	Madison Beach Road	77
CT	Stratford	80
CT	Westport	80
NY	Flax Pond	76

NY	White Plains	78
NJ	Leonia	78
NJ	Rider University	79
NJ	Rutgers University	79
NJ	Leonia	78
PA	Bristol	73

The surface-level back trajectories (Figure 2) show that air originated off the New Jersey coast. From here, the air moved onshore as high pressure began to build over the region behind a passing low-pressure system. Air then made a turn toward the southeast as high pressure continued to meander over the region. Finally, the air made a turn toward the northeast where the trajectories finally reached their endpoints along the I-95 corridor in Pennsylvania, New Jersey, New York, and Connecticut. The air stayed at the surface during the duration of its path, where it was able to pick up localized emissions from cars, trucks, and industry. The air also recirculated some previously polluted air along the New Jersey coast, which further enhanced ozone levels under the favorable meteorological conditions.

The mid-level back trajectories (Figure 3) show that air at this level originated over several locations across the Mid-Atlantic under the influence of building high pressure. Trajectories that ended in Pennsylvania and New Jersey originated over Maryland where the air traveled southwesterly into Virginia. The trajectories then made a turn toward the northeast where they reached their endpoints. Trajectories that ended in New York and Connecticut originated over Pennsylvania and parts of New York. Air traveled briefly in a southwesterly direction before making a turn toward the south and southeast over southeastern Pennsylvania. From here, the trajectories made a northeasterly turn where they traveled over northern New Jersey and Long Island, picking up more emissions from local industry. A gradual sinking motion can be observed under the influence of high pressure, allowing for polluted air aloft to mix down to the surface before reaching their destinations in New York and coastal Connecticut.

Upper-level trajectories (Figure 4) originated in a variety of locations from southern Ontario to Ohio including multiple points of origin in-between. The group of trajectories traveling into New Jersey and Pennsylvania took a westward path across the state of Pennsylvania, where it passed over the cities of Harrisburg, Lancaster, and Allentown. The upper-level trajectories picked up emissions from local industry before passing over Philadelphia and the suburbs. Prior to arrival, trajectories in this group slowed down allowing pollutants to accumulate along the I-95 corridor and leading to several exceedances along this interstate route. Meanwhile, trajectories traveling to New York City, Long Island and Connecticut followed a general south-southwest path over upstate New York. This group of trajectories traveled over the lower Hudson Valley and in many cases over the New York City metropolitan center. During the final hours of transit, upper-level trajectories slowed to a crawl and made a turn eastward toward Long Island and the Sound, where peaking units that may have been operating. Here, trajectories likely deposited their emissions from the metropolitan center just downwind at points east of the city in Long Island and coastal Connecticut, leading to other exceedances.

Finally, Figure 5 shows the National Air Quality Index observed on August 5th, the day prior to this exceedance event. As shown in the figure, widespread levels of moderate and isolated areas of USG ozone air quality were observed across much of the United States. As a result, the localized and regional transport of ozone precursors in combination with a previously polluted air mass, played a large role in the widespread nature of the exceedances observed on August 6th.

Figure 2. 48-hour Back Trajectories for August 6, 2021 at 10 meters

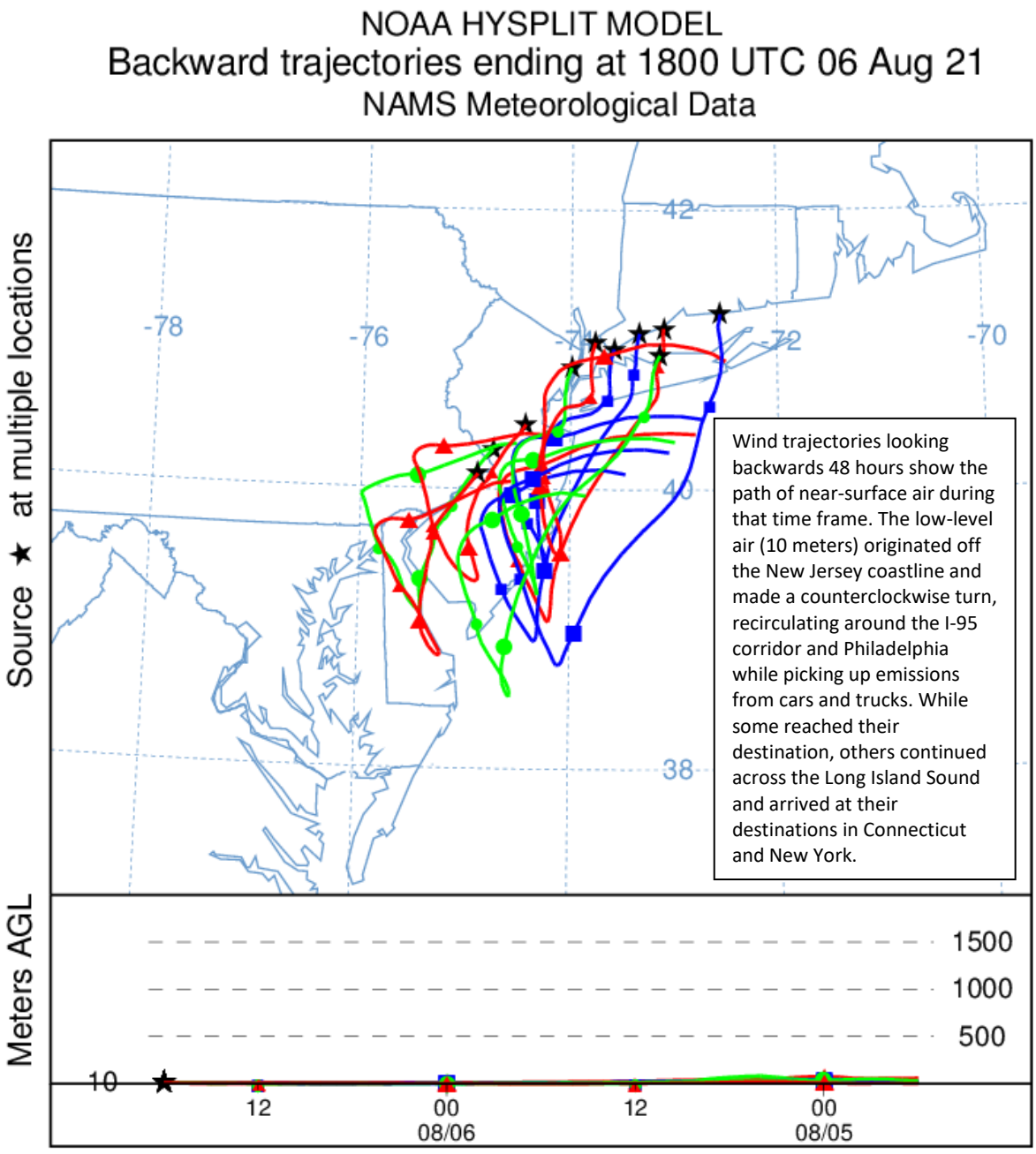


Figure 3. 48-hour Back Trajectories for August 6, 2021 at 500 meters

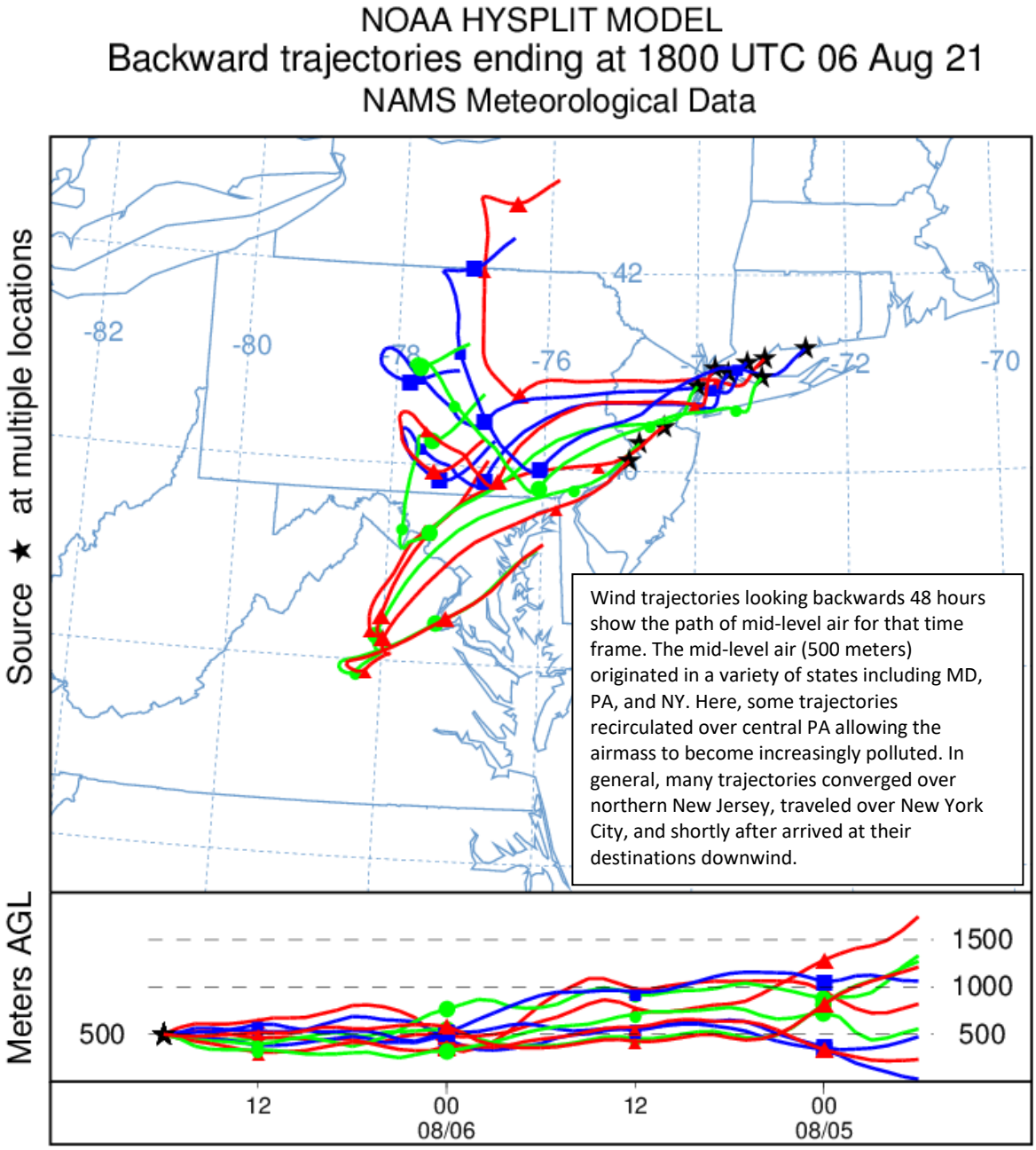


Figure 4. 48-hour Back Trajectories for August 6, 2021 at 1500 meters

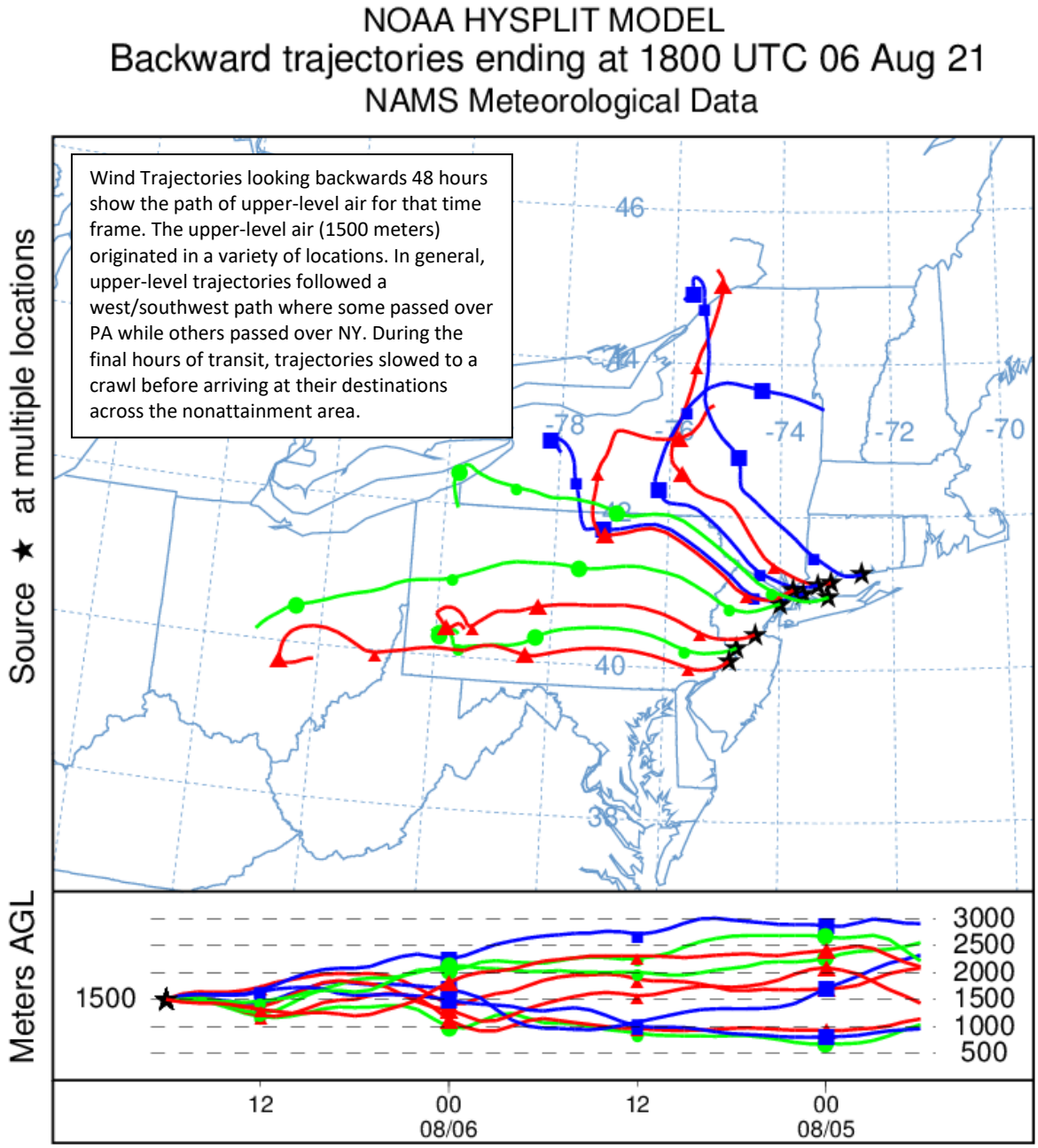
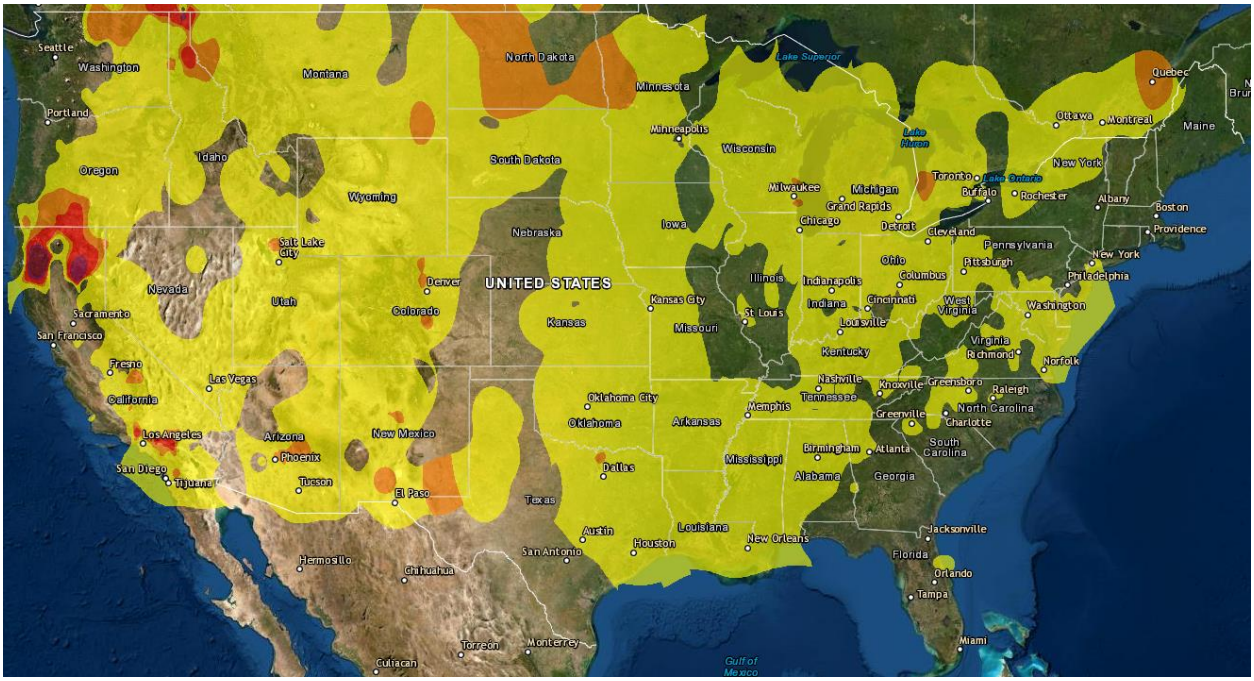


Figure 5. Combined Air Quality Index for the United States on August 5, 2021



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/ .