Ozone National Ambient Air Quality Standard Health Exceedances on August 7, 2021

On Saturday, August 7, 2021, there were no 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 8/7/2021

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	48
Bayonne	64
Brigantine	47
Camden Spruce St	No Data
Chester	56
Clarksboro	51
Colliers Mills	54
Columbia	44
Flemington	60
Leonia	70
Millville	48
Monmouth University	57
Newark Firehouse	62
Ramapo	52
Rider University	59
Rutgers University	56
Washington Crossing*	57
TOTAL EXCEEDANCES	0

*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 four (4) 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 8/7/2021

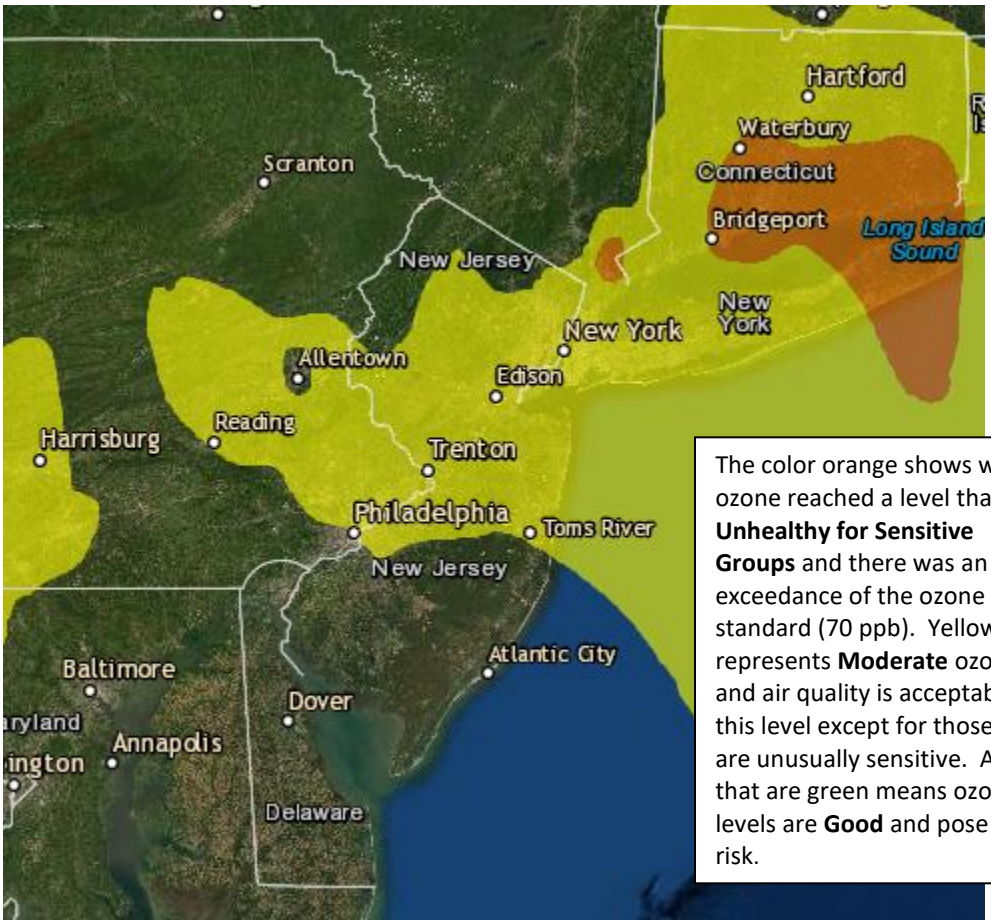
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	65
CT	Greenwich	63
CT	Madison-Beach Road	83
CT	Middletown-CVH-Shed	70
CT	New Haven	78
CT	Stratford	74
CT	Westport	68
DE	BCSP (New Castle Co.)	46
DE	BELLFNT2 (New Castle Co.)	49
DE	KILLENS (Kent Co.)	45
DE	LEWES (Sussex Co.)	46
DE	LUMS 2 (New Castle Co.)	47
DE	MLK (New Castle Co.)	49
DE	SEAFORD (Sussex Co.)	40
MD	Fair Hill	52
NY	Babylon	62
NY	Bronx - IS52	62
NY	CCNY	64
NY	Flax Pond	65
NY	Fresh Kills	61
NY	Holtsville	60
NY	Pfizer Lab	66
NY	Queens	61
NY	Riverhead	65
NY	Rockland Cty	41
NY	White Plains	71
PA	BRIS (Bucks Co.)	57
PA	CHES (Delaware Co.)	58
PA	NEWG (Chester Co.)	51
PA	NORR (Montgomery Co.)	51
PA	LAB (Philadelphia Co.)	58
PA	NEA (Philadelphia Co.)	54
PA	NEW (Philadelphia Co.)	59
	TOTAL EXCEEDANCES	4

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 7, 2021 NAAQS = 70 ppb
Connecticut	15
Delaware	3
Maryland	3
New Jersey	8
New York	13
Pennsylvania	8

Figure 1. Ozone Air Quality Index for August 7, 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 continued to influence the northern nonattainment area throughout much of the day on Saturday, August 7th while an area of low pressure to the south was slow to arrive. These weather features allowed portions of the northern and southern nonattainment areas to experience opposing conditions toward the late afternoon and evening hours. These features, in combination with a previously polluted air mass and local/regional transport of emissions resulted in several exceedances in the northern nonattainment area on this day.

In the days prior to August 7th, high pressure had been the main weather story providing sunny skies and hot temperatures to the region. This area of high pressure that previously dominated the weather pattern had weakened allowing a wave of low pressure associated with a stationary front off the coast to advance northward. During the morning and early afternoon hours, many locations across the nonattainment area observed a thin layer of clouds that gave way to sunshine some/most of the time. Meteorological conditions from across the region show that temperatures reached the upper 80s with light south/southwesterly winds, conditions favorable for ozone formation. While the approaching area of low pressure was slow to arrive, clouds ahead of the front moved in from south to north blanketing southern New Jersey in the late afternoon and shutting down ozone production in this area. Additionally, northeastern portions of New Jersey experienced more of a southerly wind component, providing a maritime influence on some locations, keeping them clean throughout the day. Meanwhile, the area of low pressure had yet to reach portions of the northern nonattainment area, resulting in sunny skies and favorable conditions for ozone to persist into the evening hours. As a result, four exceedances of the NAAQS were observed in this area.

These favorable meteorological conditions mentioned above in combination with a previously deteriorated air mass and local/regional transport, allowed for ozone concentrations to reach the unhealthy for sensitive groups (USG) category across New York and Connecticut.

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 7th shows that the exceedances along the CT coastline and lower Hudson Valley, NY were influenced by weakening high pressure and a developing area of low pressure over the Mid-Atlantic region. This atmospheric setup allowed for favorable weather conditions for ozone formation as well as the transport of localized/regional emissions and previously polluted air, leading to elevated ozone levels over portions of the northern nonattainment area.

Figures 2, 3, and 4 show the back trajectories starting at different wind heights for the monitored exceedances on August 7, 2021. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedance. Four 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	Madison-Beach Road	83
CT	New Haven	78
CT	Stratford	74
NY	White Plains	71

The surface-level back trajectories (Figure 2) show that air originated off the Delmarva Peninsula and traveled north-northeastward along coastal New Jersey before passing over portions of the NYC metropolitan area, Long Island, and Long Island Sound respectively into arrival. As air traveled north, any previously polluted air from the days prior, that may have collected off the Mid-Atlantic coast or over the Long Island Sound, had the opportunity be transport to the effected monitors. Additionally, as air passed over the NYC metropolitan area and Long Island, prior to arrival, any emissions from cars, trucks, and industry would have further enhanced ozone levels under favorable weather conditions.

Meanwhile, the mid-level back trajectories (Figure 3) show that air originated over northeastern Pennsylvania and as was greatly influence by the high-pressure during its transit. As air followed high-pressure circulation, it traveled southeast off the coast of New Jersey, made a clockwise rotation back on shore, before continuing north and northeast, along the I-95 corridor, passing over both the Philadelphia and NYC metropolitan areas into arrival. During its transit, air had several opportunities to regionally transport previously polluted air from days prior and then under the influence of high pressure, descend toward the surface enhancing ozone levels in the northern nonattainment area.

Upper-level trajectories (Figure 4) originated over the southwest corner of Pennsylvania, from here they moved in a westerly direction over the state before making a turn southwestward toward Maryland. Air then circulated in a clockwise direction over the Chesapeake Bay area. Here, it picked up some emissions from local industry, and made a turn toward the northeast, moving over eastern Pennsylvania, northern New Jersey, and the New York City Metropolitan area before reaching their destinations in New York City and coastal Connecticut. The trajectories show that air had a general sinking motion, allowing for polluted air aloft to mix down to the surface, further enhancing ozone levels.

Figure 5 shows the National Air Quality Index observed on August 6th, the day prior to this exceedance event. As seen in the figure, several areas in the nonattainment area reached the unhealthy for sensitive groups category along with many more reaching the moderate category. These widespread, elevated ozone levels indicate that the previously polluted air over the region aided in further enhancing ozone levels where exceedances were observed. The local and reginal transport of ozone precursors, along with a previously polluted air mass and favorable meteorological conditions, allowed for ozone to reach the unhealthy for sensitive groups category in New York and Connecticut.

Figure 2. 48-hour Back Trajectories for August 7, 2021 at 10 meters

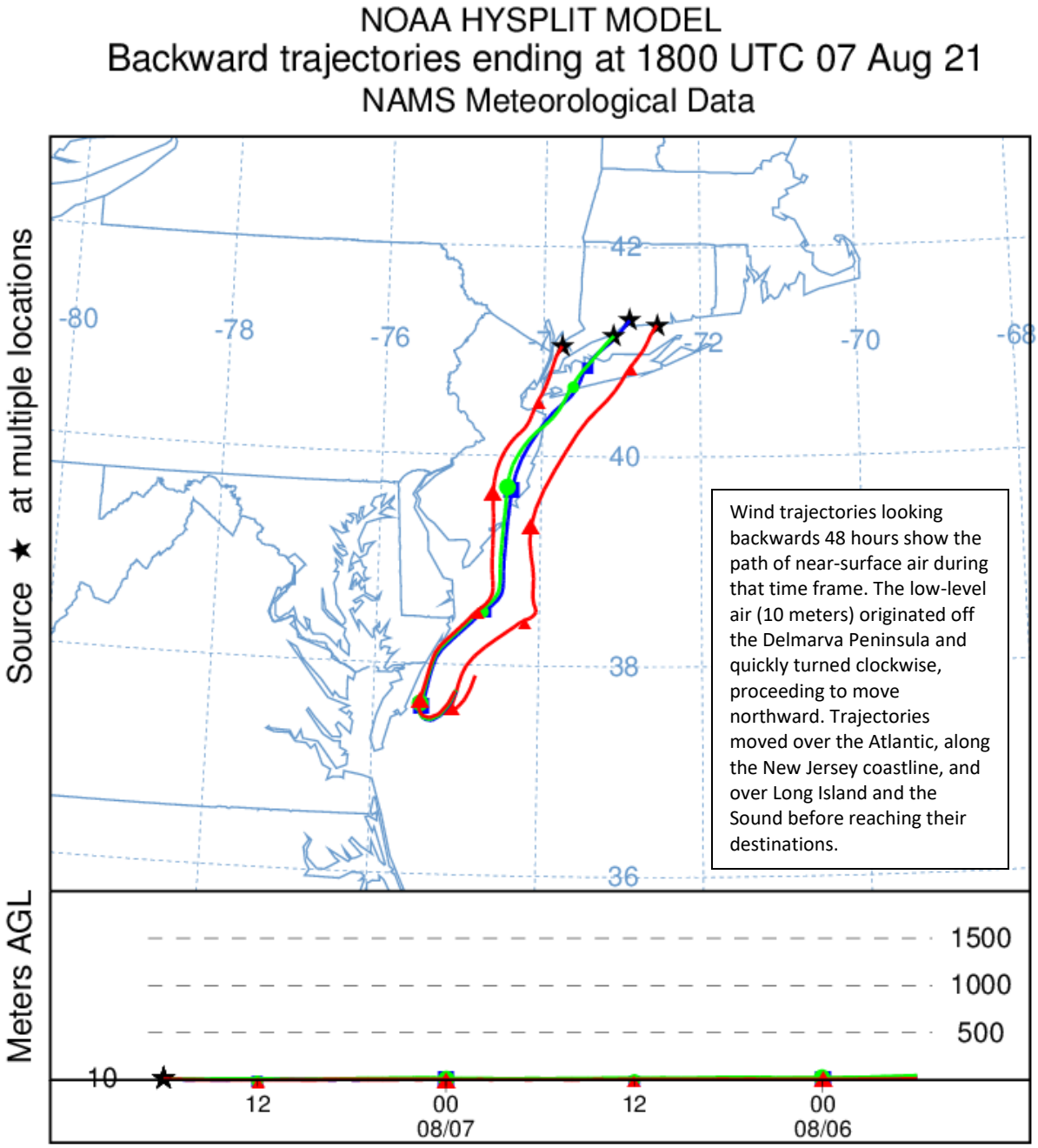


Figure 3. 48-hour Back Trajectories for August 7, 2021 at 500 meters

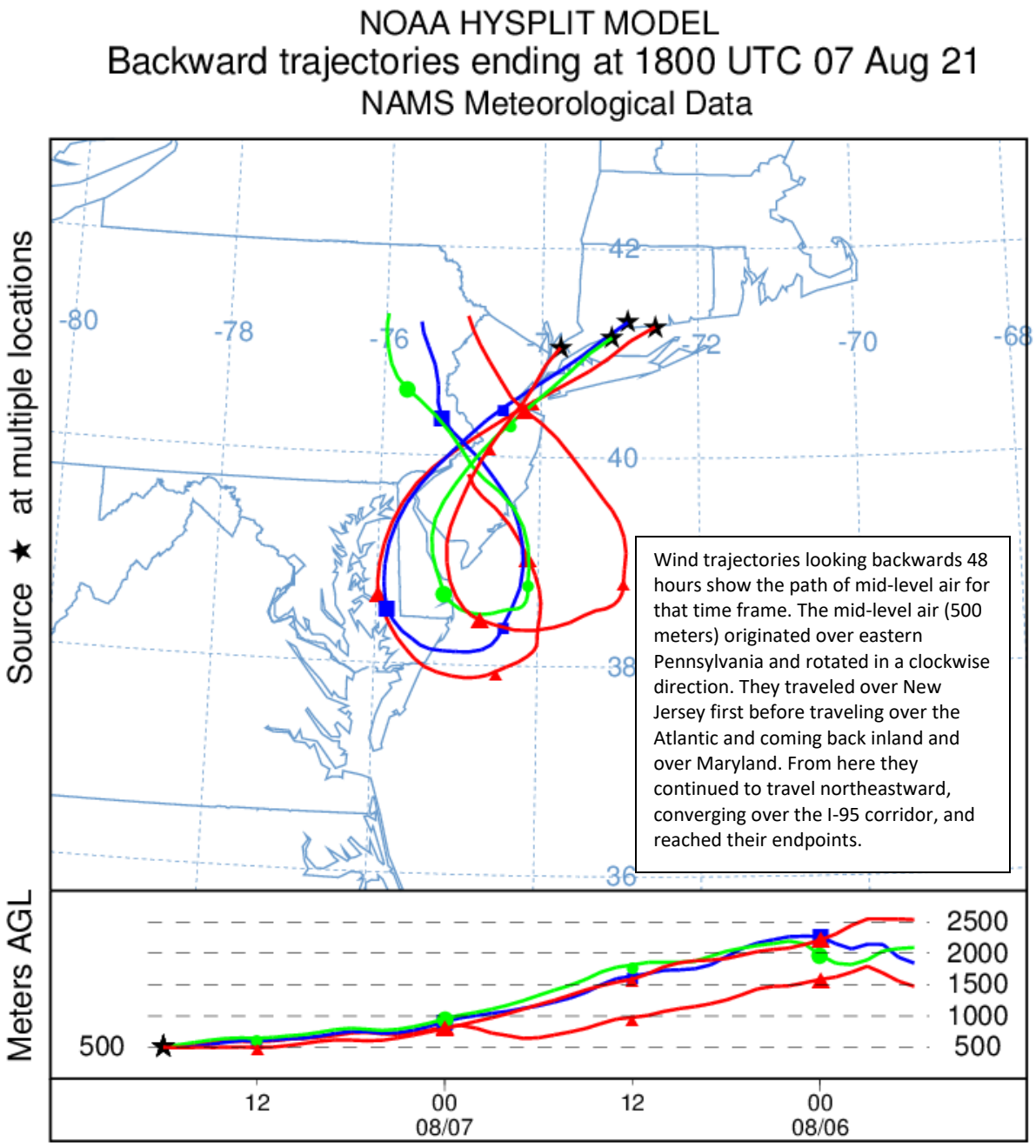


Figure 4. 48-hour Back Trajectories for August 7, 2021 at 1500 meters

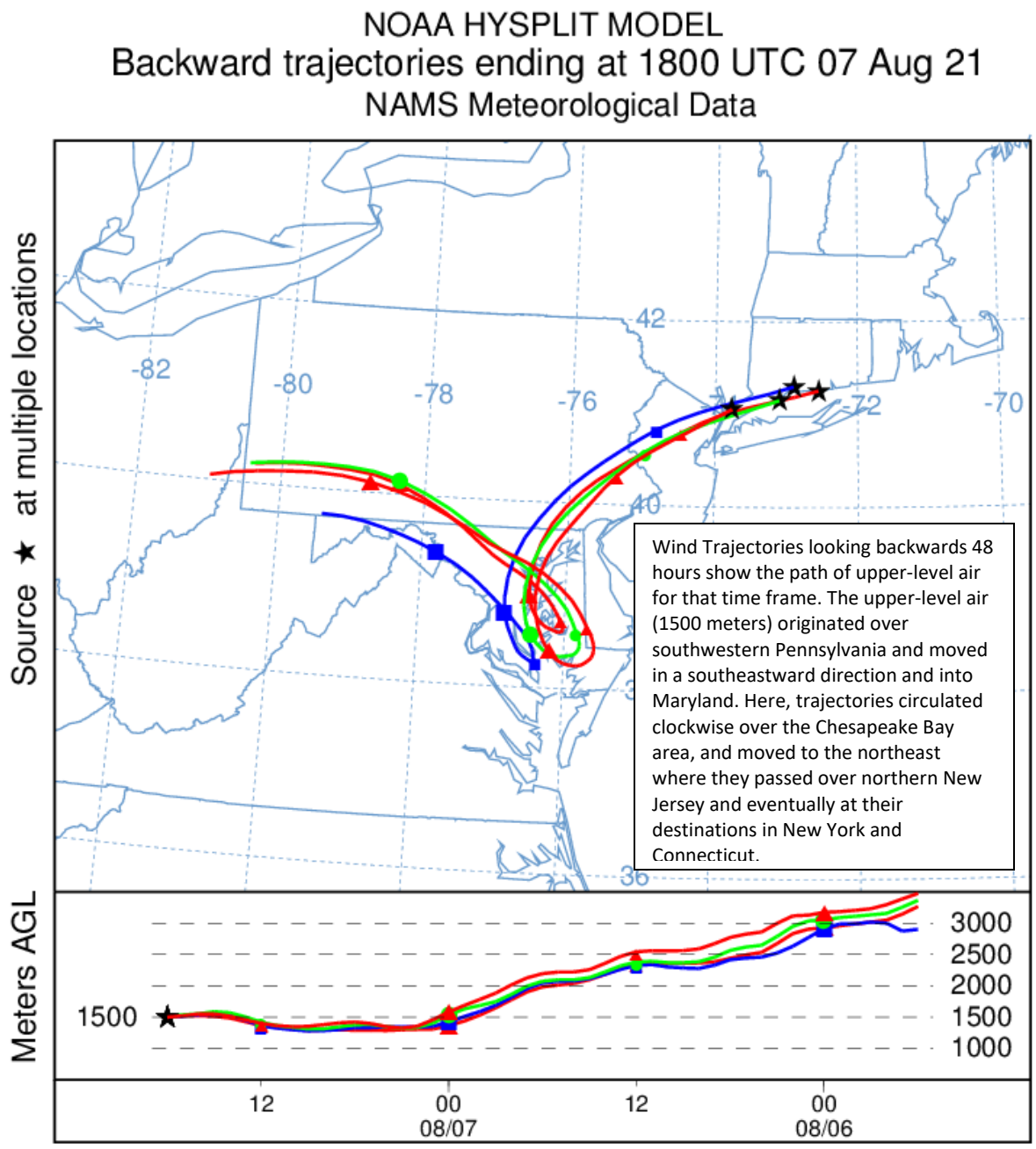
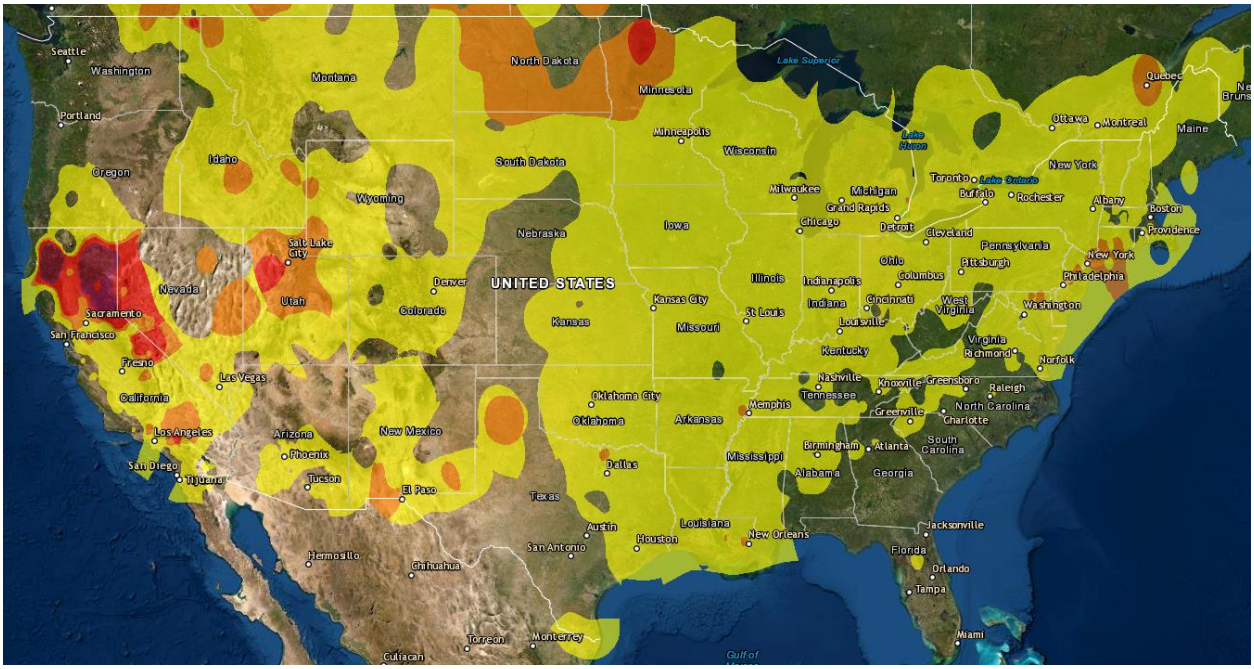


Figure 5. Combined Air Quality Index for the United States on August 6, 2021



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/ .