Ozone National Ambient Air Quality Standard Health Exceedances on August 11, 2021

On Wednesday, August 11, 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 8/11/2021

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	38
Bayonne	63
Brigantine	42
Camden Spruce St	45
Chester	45
Clarksboro	40
Colliers Mills	37
Columbia	44
Flemington	51
Leonia	69
Millville	40
Monmouth University	39
Newark Firehouse	57
Ramapo	44
Rider University	65
Rutgers University	61
Washington Crossing*	59
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 was one (1) exceedance 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 8/11/2021

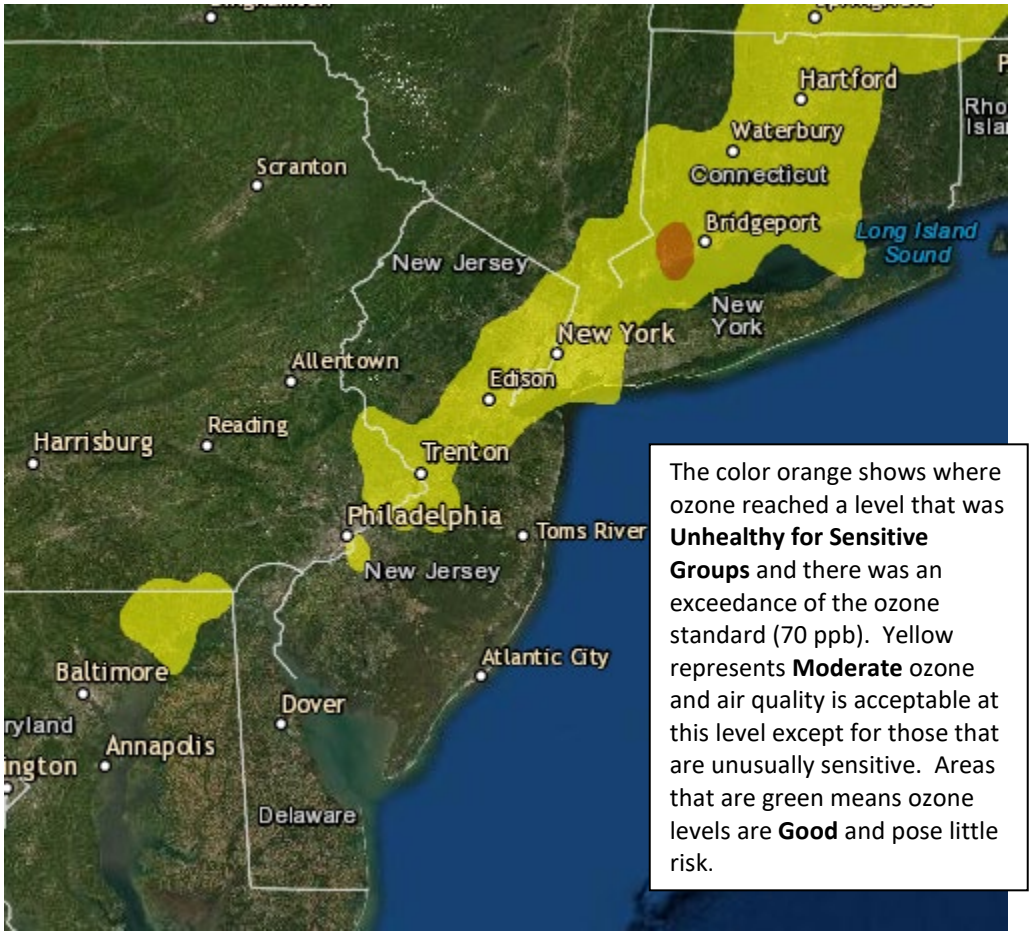
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	69
CT	Greenwich	63
CT	Madison-Beach Road	59
CT	Middletown-CVH-Shed	66
CT	New Haven	57
CT	Stratford	64
CT	Westport	71
DE	BCSP (New Castle Co.)	41
DE	BELLFNT2 (New Castle Co.)	46
DE	KILLENS (Kent Co.)	42
DE	LEWES (Sussex Co.)	35
DE	LUMS 2 (New Castle Co.)	40
DE	MLK (New Castle Co.)	46
DE	SEAFORD (Sussex Co.)	39
MD	Fair Hill	56
NY	Babylon	47
NY	Bronx - IS52	53
NY	CCNY	59
NY	Flax Pond	54
NY	Fresh Kills	60
NY	Holtsville	44
NY	Pfizer Lab	59
NY	Queens	55
NY	Riverhead	45
NY	Rockland Cty	49
NY	White Plains	66
PA	BRIS (Bucks Co.)	55
PA	CHES (Delaware Co.)	47
PA	NEWG (Chester Co.)	44
PA	NORR (Montgomery Co.)	47
PA	LAB (Philadelphia Co.)	48
PA	NEA (Philadelphia Co.)	55
PA	NEW (Philadelphia Co.)	51
	TOTAL EXCEEDANCES	1

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 11, 2021 NAAQS = 70 ppb
Connecticut	16
Delaware	3
Maryland	3
New Jersey	8
New York	13
Pennsylvania	8

Figure 1. Ozone Air Quality Index for August 11, 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 Wednesday August 11th, 2021, as various surface troughs developed throughout the day. This atmospheric setup allowed for favorable weather conditions for ozone formation, as well as the local/regional transport of emissions within the nonattainment area. As a result, elevated levels of ozone were observed along much of the I-95 corridor and into south/central Connecticut on this day with an isolated exceedance at the Westport, CT monitor.

A large Bermuda High continued to remain anchored over the western Atlantic allowing for hot and humid conditions across the nonattainment area. These conditions supported various surface troughs or waves of low pressure which influenced cloud cover across the region. Initially, low-level clouds were observed over much of the area as rain showers occurred at northern locations in the early morning hours. By mid-morning, skies cleared allowing for a mix of sun and clouds for a good portion of the region. Skies to the north however, remained mostly sunny throughout the day. It's likely the additional sunshine along the Connecticut coast led to greater ozone production in this location. Additionally, a general south to southwesterly flow at the surface allowed for the transport of emissions from cars, trucks, and industry along the I-95 corridor, further enhancing ozone levels in these northern locations. As the day progressed, showers and thunderstorms passed over the nonattainment area in the evening hours, providing some much-needed relief to the heat of the day.

Overall, the isolated ozone exceedance at the Westport, CT monitor can be attributed to the localized/regional transport of emissions into a location experiencing weather conditions favorable for ozone formation.

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 11th shows that the exceedance in Connecticut was influenced by high pressure over the western Atlantic, along with hot and humid conditions. 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 in Connecticut.

Figures 2, 3, and 4 show the back trajectories starting at different wind heights for the monitored exceedance on August 11, 2021. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedance. One monitoring station was chosen to model back trajectories and are listed in Table 4.

Table 4. Monitoring Station with an 8-hr Ozone Exceedance that was Selected to Run 48-hr Back Trajectories

STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Westport	71

The surface-level back trajectory (Figure 2) shows that air originated off the North Carolina coast and traveled in a north-northeasterly direction, along the Delmarva and New Jersey coastlines, before passing over portions of the NYC metropolitan area and Long Island Sound. In general, a regionally clean air mass was observed upwind in the days leading up to this high ozone event. As a result, it can be concluded that much of the polluted air arrived at the exceedance location from locally generated sources or localized transport around the impacted monitor. Additionally, as air passed over the NYC metropolitan area and Long Island, any emissions from cars, trucks, and industry would have further enhanced ozone levels under the favorable weather conditions.

The mid-level back trajectory (Figure 3) and upper-level trajectory (Figure 4) had similar paths, originating over the Southeastern US before traveling over the Ohio River Valley, Delaware Valley, and New York City Metropolitan area in reaching their final destination. Mid-level trajectories originated over Mississippi, traveling in a northeasterly direction while circulating around high pressure. This allowed air to move over Tennessee, Kentucky, West Virginia, and Pennsylvania. From here, it traveled over the Philadelphia metropolitan area and moved along the I-95 corridor to New York City, eventually moving over Long Island Sound and arriving in Connecticut. While traveling over these highly urbanized areas, the air likely picked up emissions from local industry along the way. The gentle sinking motion at this level also suggests that these ozone precursors were able to mix down to the surface from aloft, enhancing ozone formation at the surface. Meanwhile, the upper-level trajectory traveled in a similar, but slightly more northern path, moving over Missouri, Illinois, Indiana, Ohio, Pennsylvania, northern New Jersey and New York City before reaching its destination in Connecticut.

Figure 5 shows the National Air Quality Index observed on August 10th, the day prior to this exceedance event. As shown in the figure, air quality conditions were generally clean over the eastern half of the United States on this day. This indicates that localized emissions from the NYC metropolitan area/Long Island Sound region, under the influence of favorable weather conditions for ozone formation, likely contributed to the isolated exceedance at the Westport, CT monitor on August 11th.

Figure 2. 48-hour Back Trajectories for August 11, 2021 at 10 meters

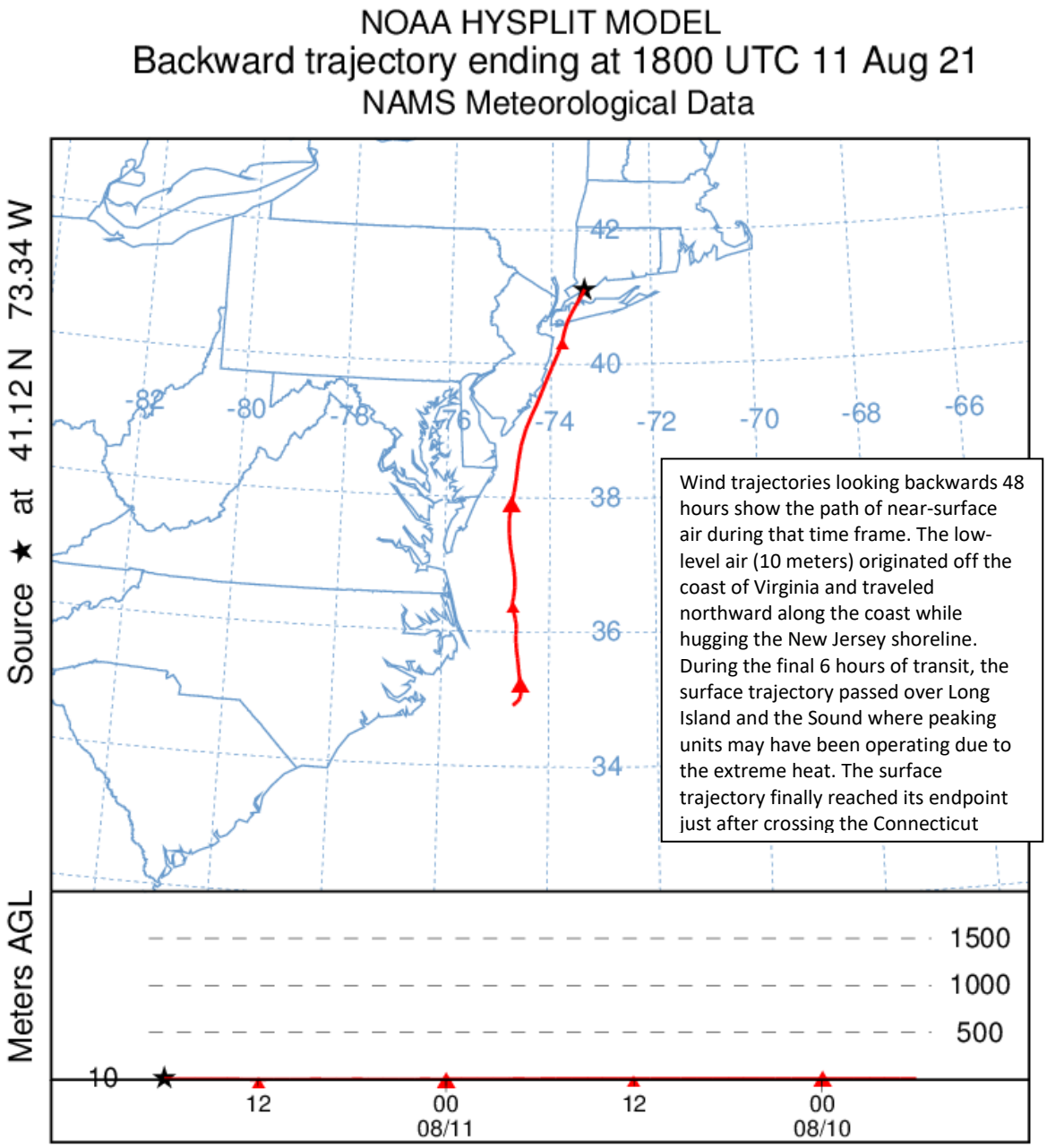


Figure 3. 48-hour Back Trajectories for August 11, 2021 at 500 meters

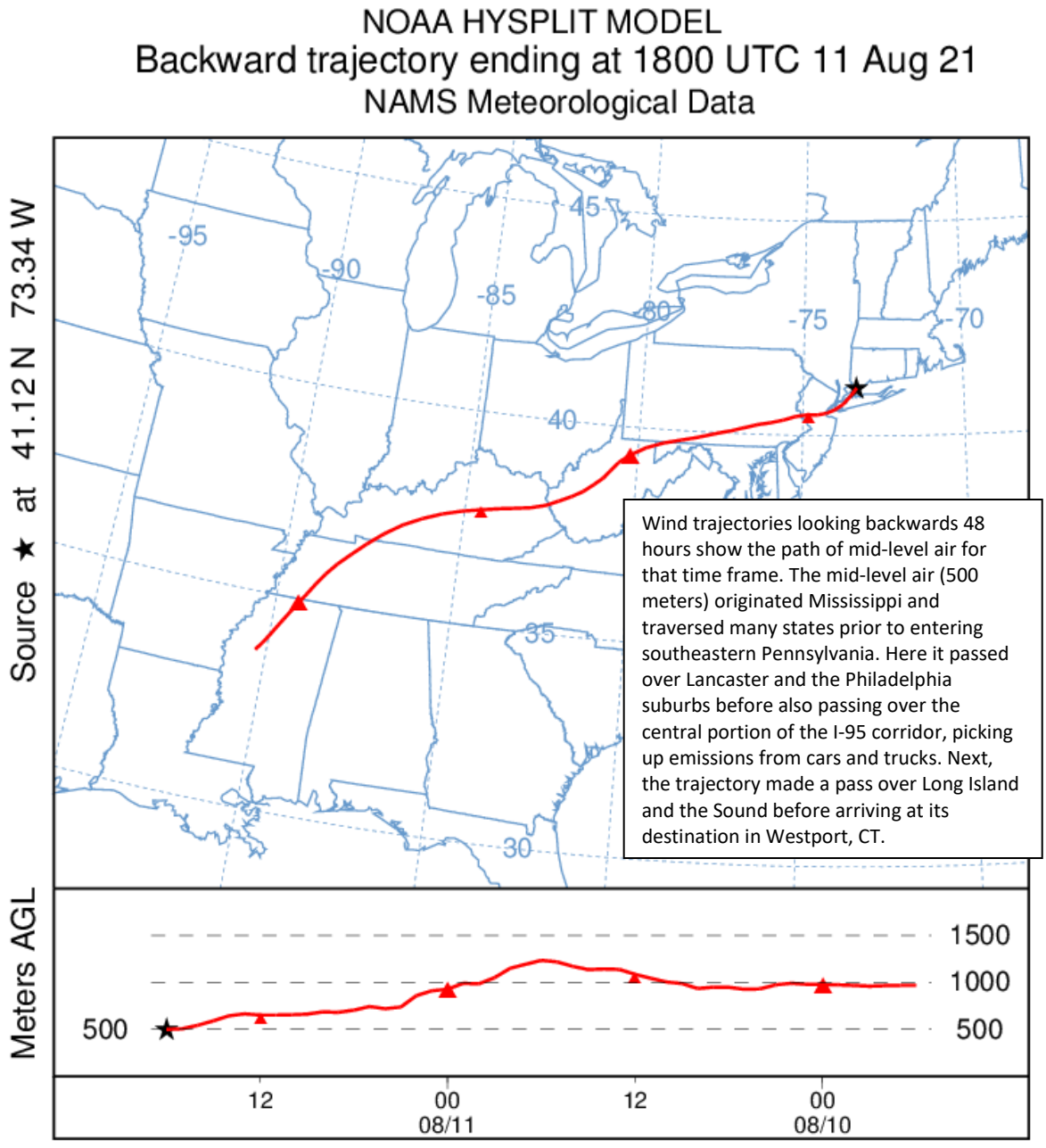


Figure 4. 48-hour Back Trajectories for August 11, 2021 at 1500 meters

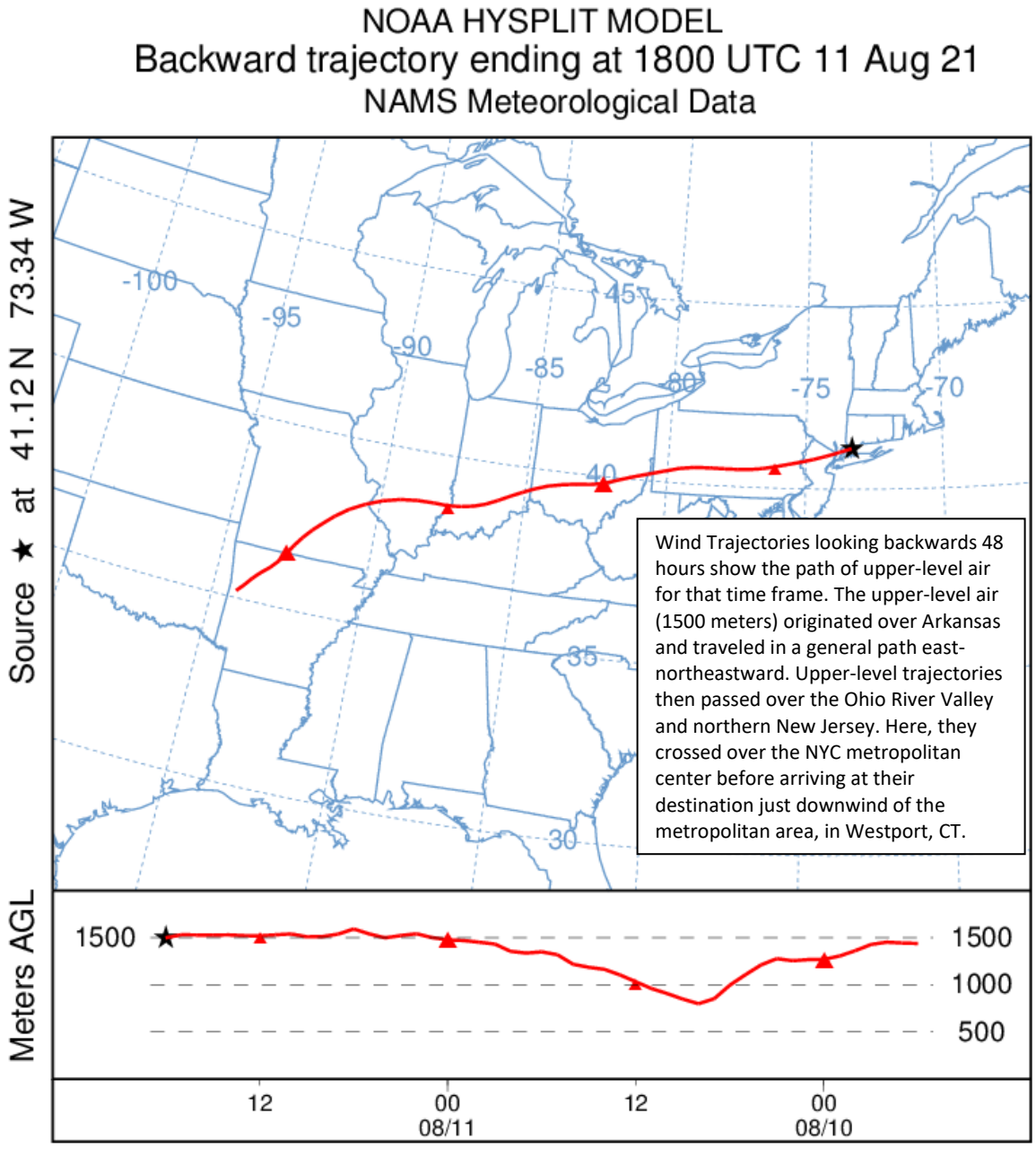
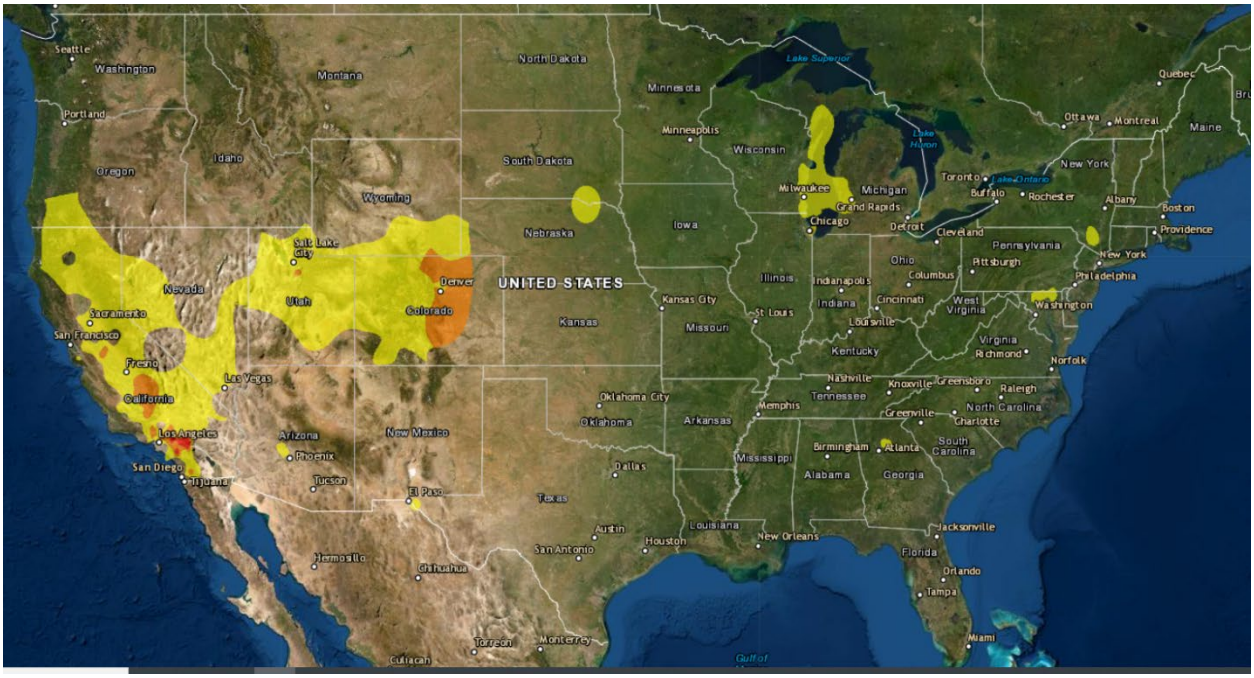


Figure 5. Ozone Air Quality Index for the United States on August 10, 2021



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/ .