Ozone National Ambient Air Quality Standard Health Exceedances on July 22, 2020

Exceedance Locations and Levels

On Wednesday, July 22, 2020, there were two (2) 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 7/22/2020

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	51
Bayonne	67
Brigantine	46
Camden Spruce St	60
Chester	51
Clarksboro	53
Colliers Mills	54
Columbia	48
Flemington	57
Leonia	74
Millville	No Data
Monmouth University	57
Newark Firehouse	67
Ramapo	55
Rider University	73
Rutgers University	70
Washington Crossing*	69
TOTAL EXCEEDANCES	2

*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 non-attainment areas, there were seven (7) exceedances of the ozone NAAQS. See Table 2.

Table 2. Ozone Concentrations at Out-of-State Monitoring Stations in New Jersey's Ozone Non-Attainment Areas on 7/22/2020

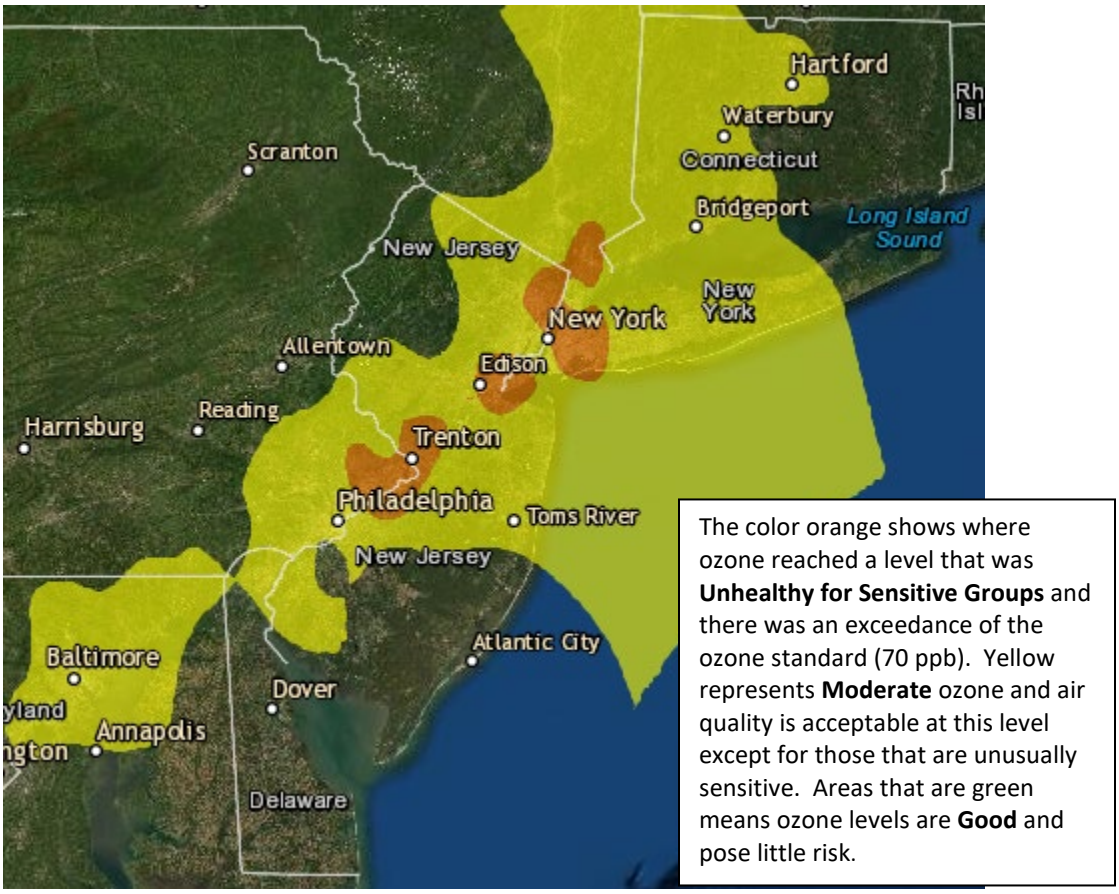
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	67
CT	Greenwich	58
CT	Madison-Beach Road	52
CT	Middletown-CVH-Shed	51
CT	New Haven	55
CT	Stratford	59
CT	Westport	57
DE	BCSP (New Castle Co.)	54
DE	BELLFNT2 (New Castle Co.)	54
DE	KILLENS (Kent Co.)	50
DE	LEWES (Sussex Co.)	52
DE	LUMS 2 (New Castle Co.)	51
DE	MLK (New Castle Co.)	59
DE	SEAFORD (Sussex Co.)	49
MD	Fair Hill	56
NY	Babylon	62
NY	Bronx - IS52	71
NY	CCNY	73
NY	Fresh Kills	73
NY	Holtsville	58
NY	Pfizer Lab	69
NY	Queens	71
NY	Riverhead	55
NY	Rockland Cty	62
NY	White Plains	72
PA	BRIS (Bucks Co.)	71
PA	CHES (Delaware Co.)	58
PA	NEWG (Chester Co.)	52
PA	NORR (Montgomery Co.)	67
PA	LAB (Philadelphia Co.)	61
PA	NEA (Philadelphia Co.)	76
PA	NEW (Philadelphia Co.)	70
	TOTAL EXCEEDANCES	7

The number of days in 2020 on which exceedances of the ozone NAAQS were recorded for all the states within New Jersey's ozone non-attainment areas is summarized in Table 3.

Table 3. Number of Days Ozone NAAQS was Exceeded in NJ's Non-Attainment Areas in 2020

STATE	# of Days NAAQS was Exceeded January 1 – July 22, 2020 NAAQS = 70 ppb
Connecticut	6
Delaware	1
Maryland	0
New Jersey	4
New York	4
Pennsylvania	3

Figure 1. Ozone Air Quality Index for July 22, 2020



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

Weak low pressure moved through the area on Wednesday as high pressure also began to move into the region, allowing conditions that were conducive for ozone formation throughout the day. Localized wind patterns along with partly sunny skies and warm temperatures allowed for widespread moderate levels of ozone to be observed along with some spots reaching the unhealthy for sensitive groups (USG) category along the I-95 corridor and New York City.

Early on July 22nd, a weak low pressure system located over central New Jersey formed along a stationary front that was draped along southern New Jersey and extended through northern Delaware, northern Maryland, and into West Virginia. This low pressure system then merged with another low located of the coast, and moved northward into southern New York State by late morning. Winds shifted out of the southwest over the Philadelphia metropolitan area and much of New Jersey, while New York City saw easterly winds. These localized wind patterns allowed pollutants to build up along the I-95 corridor and in New York City, easterly winds were able to transport pollutants from the Long Island sound into the city.

High pressure then began to nose its way in from the southwest as the day progressed, with a frontal boundary located on the periphery of this high. Temperatures were able to climb into the low 90s across much of New Jersey and into the mid to high 80s across New York City and Long Island. Scattered thunderstorms over northern New Jersey began to form ahead of the frontal boundary by early afternoon. By early evening, a strong line of thunderstorms began to make its way into New Jersey. However, by this time, pollutants had already built up over the region and were able to reach the USG category in some places.

The ozone exceedances located along the I-95 corridor and New York City can be attributed to favorable weather conditions across the region along with wind patterns that allowed for localized pollutants to build up in these areas.

Where Did the Air Pollution that Caused Ozone Come From?

Please note, this exceedance is occurring while COVID-19 restrictions in New Jersey are in place, which have impacted transportation, business operations and energy use. As more data becomes available, the Department may have a better characterization of the conditions that influenced elevated ozone pollution levels in 2020.

Figures 2, 3, and 4 show the back trajectories starting at different wind heights for the monitored exceedances on July 22, 2020. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedance. Nine monitoring stations were chosen to run back trajectories and are listed in Table 4 below.

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)
NJ	Leonia	74

NJ	Rider University	73
NY	Bronx-IS52	71
NY	CCNY	73
NY	Fresh Kills	73
NY	Queens	71
NY	White Plains	72
PA	BRIS (Bucks Co.)	71

Back trajectories from July 22nd show that the exceedances observed across the non-attainment area were influenced by the transport of local emissions from the Philadelphia and Northern New Jersey / NYC metropolitan areas as well as the transport of residual high ozone from both the Long Island Sound region in the north and the Chesapeake Bay region in the south, regions that saw widespread moderate and isolated USG levels in the days leading up to this event.

Surface level back trajectories (Figure 2) show that air at the surface was heavily influenced by a complex frontal system over the Mid-Atlantic region. Air at this level originated off the Mid-Atlantic coast and traveled northeast off the U.S. east coast through early July 21st. Air then briefly turned northwesterly toward New Jersey in the overnight hours before turning more northerly throughout the day on July 22nd. As this air approached its destination, it slowed significantly, allowing for the build-up of localized emissions from cars, trucks and industry from the respective Northern New Jersey / NYC metropolitan and Philadelphia metropolitan areas. Air influencing the Northern New Jersey/ NYC metropolitan area traveled over the Long Island Sound prior to arrival. This region saw multiple days of high ozone prior to this event and it is likely that the localized transport of this residual ozone impacted northern portions of the non-attainment area, leading to multiple exceedances on the 22nd. Finally, surface level air influencing the Philadelphia metropolitan area / Central New Jersey, traveled along portions of the I-95 corridor into arrival. With this trajectory, air from the Chesapeake Bay region, a region that saw high levels of ozone the days prior to this event, allowed for an increasingly polluted air mass over southern portions of the non-attainment area.

In Figure 3, mid-level back trajectories (500 meters) began in various regions in the Mid-Atlantic region, ranging from North Carolina to western Pennsylvania. Throughout the entirety of the trajectory, persistent high pressure was in place over the southeastern United States, which caused mid-level air to generally be transported in a northeasterly direction under the influence of west-southwest mid-level winds. However, a stationary front draped west to east over the mid-Atlantic greatly interfered with the mid-level flow, causing the air parcels to stall and meander about the Maryland/Delaware/southern New Jersey region. This mechanism allowed pollutants aloft from the Mid-Atlantic region to mix down to the already polluted air mass over the non-attainment area from days prior. Towards the end of the trajectory, mid-level air traversed through the heavily industrialized metropolitan centers of Philadelphia and New York City, picking up additional ozone precursors along its path.

In Figure 4, upper-level air (1500 meters) originated in northern portions of Kentucky and generally traveled in an east-northeasterly direction for the entirety of its path through the Ohio River Valley. The upper-level flow was heavily influenced by high pressure centered over the southeastern United States but did not show signs of sinking towards the surface as it approached the Mid-Atlantic region. Isolated centers of low pressure formed along the stationary front over the Mid-Atlantic, which resulted in a rising motion at upper-levels in the atmosphere. Towards the end of its path, upper level air traversed

over the metropolitan regions of Philadelphia and New York City as well before arriving at their endpoints.

Figure 5 shows the National Air Quality Index observed on July 21th, the day prior to this high ozone event. As shown in the figure, moderate and USG air quality were observed within the non-attainment area as well as parts of the Mid-Atlantic region on this day. The transport of this already polluted air throughout the region, along with favorable weather conditions for ozone formation, allowed ozone to reach the unhealthy for sensitive groups category in isolated areas of the non-attainment area on July 22nd.

Figure 2. 48-hour Back Trajectories for July 22, 2020 at 10 meters

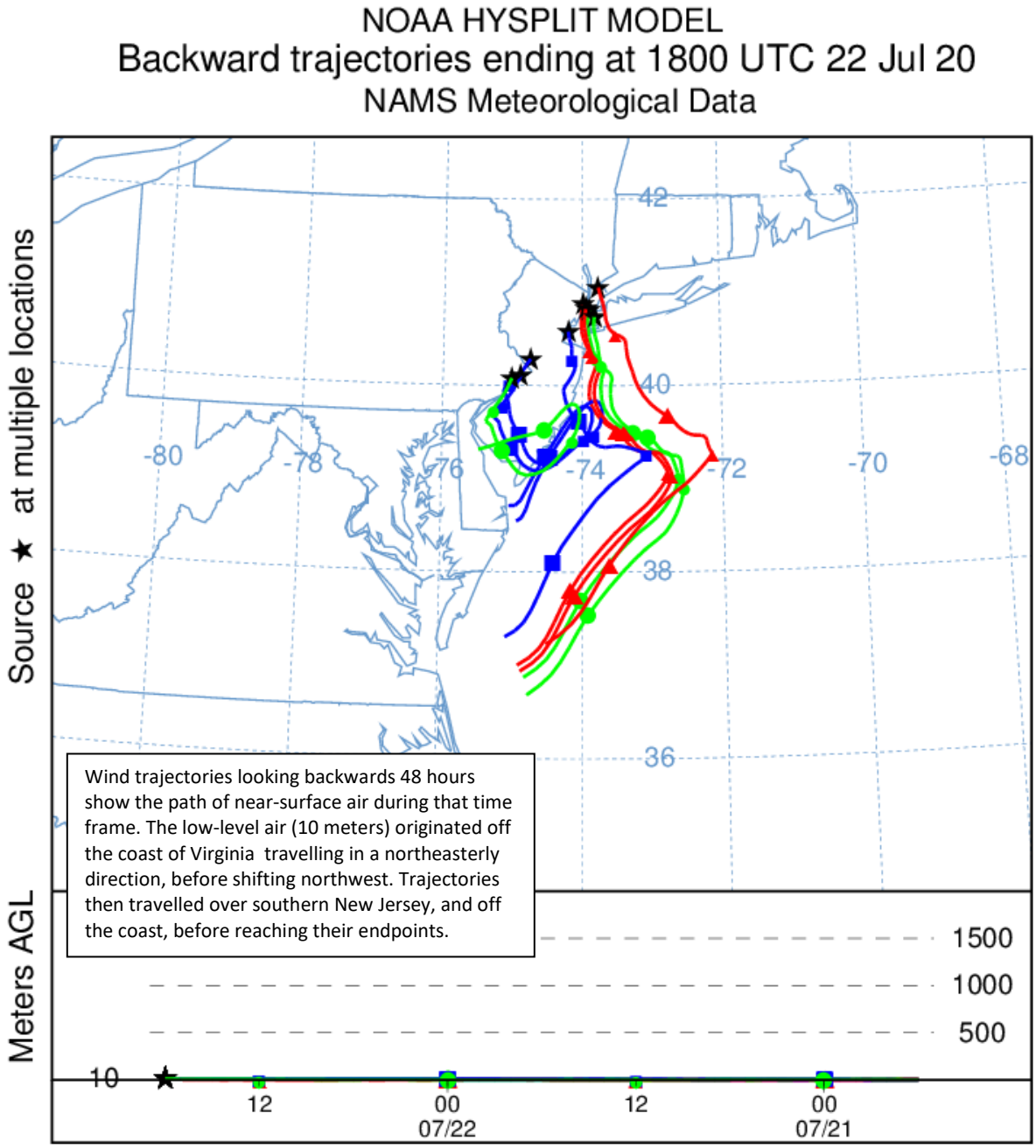


Figure 3. 48-hour Back Trajectories for July 22, 2020 at 500 meters

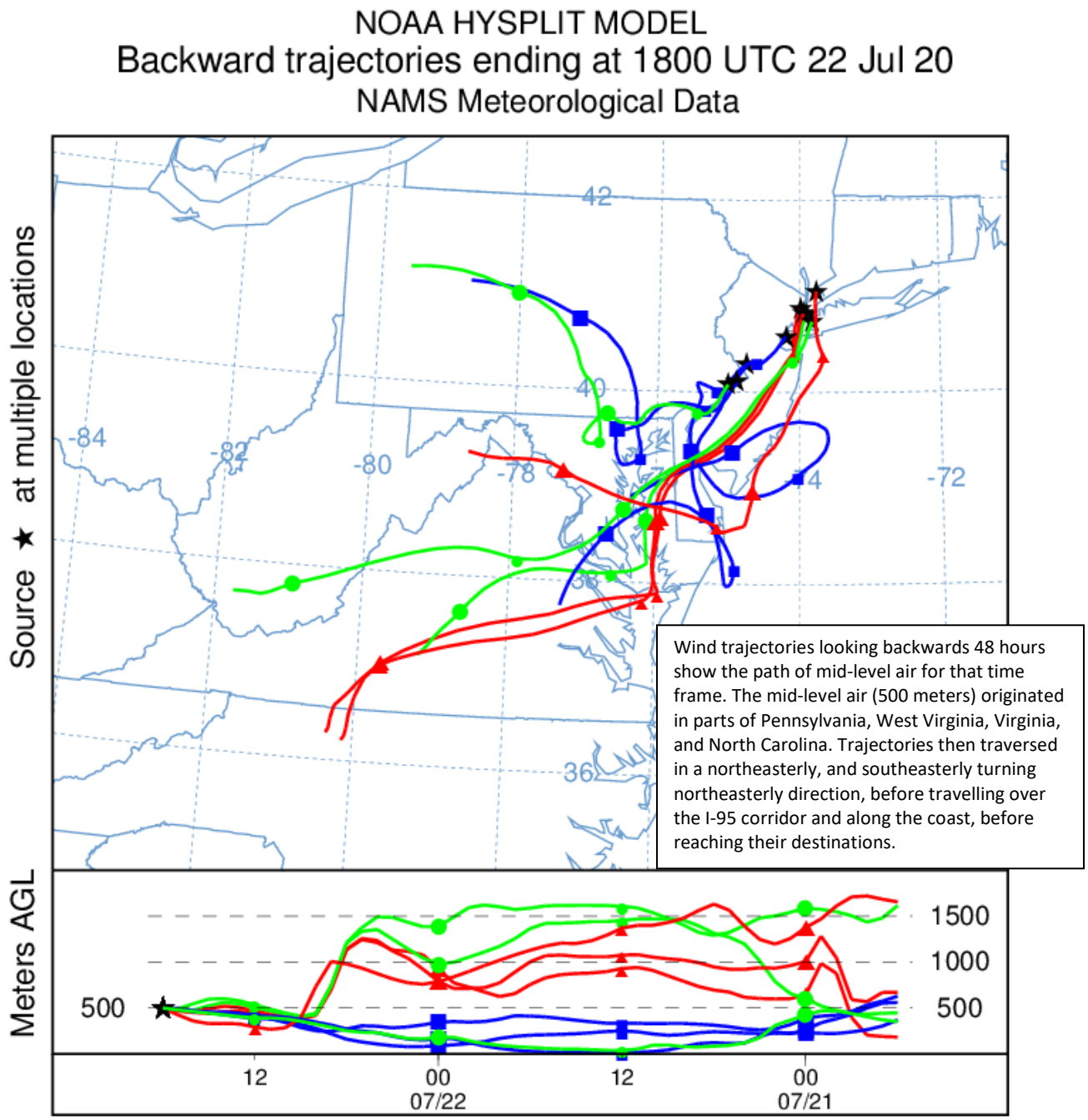


Figure 4. 48-hour Back Trajectories for July 22, 2020 at 1500 meters

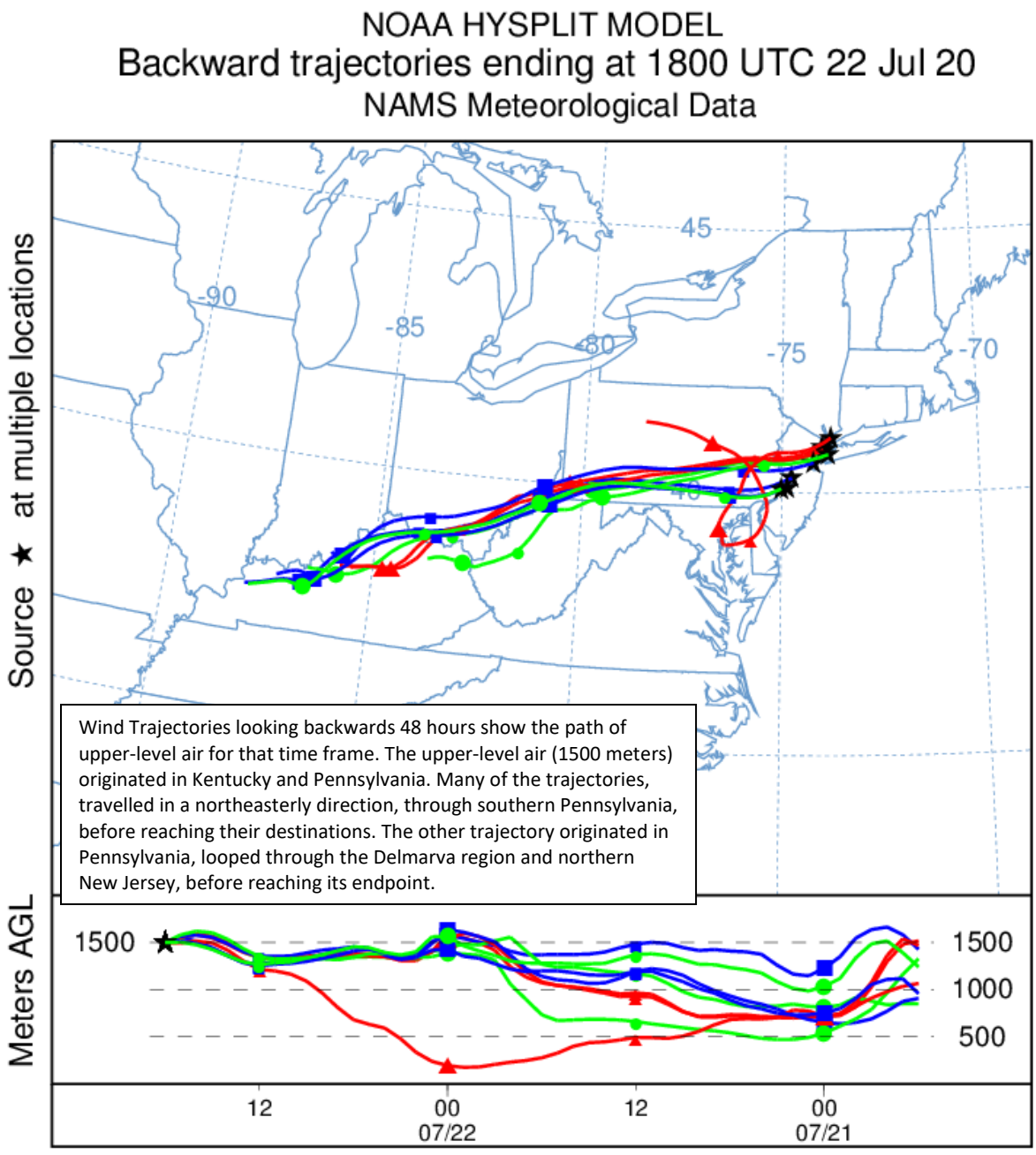
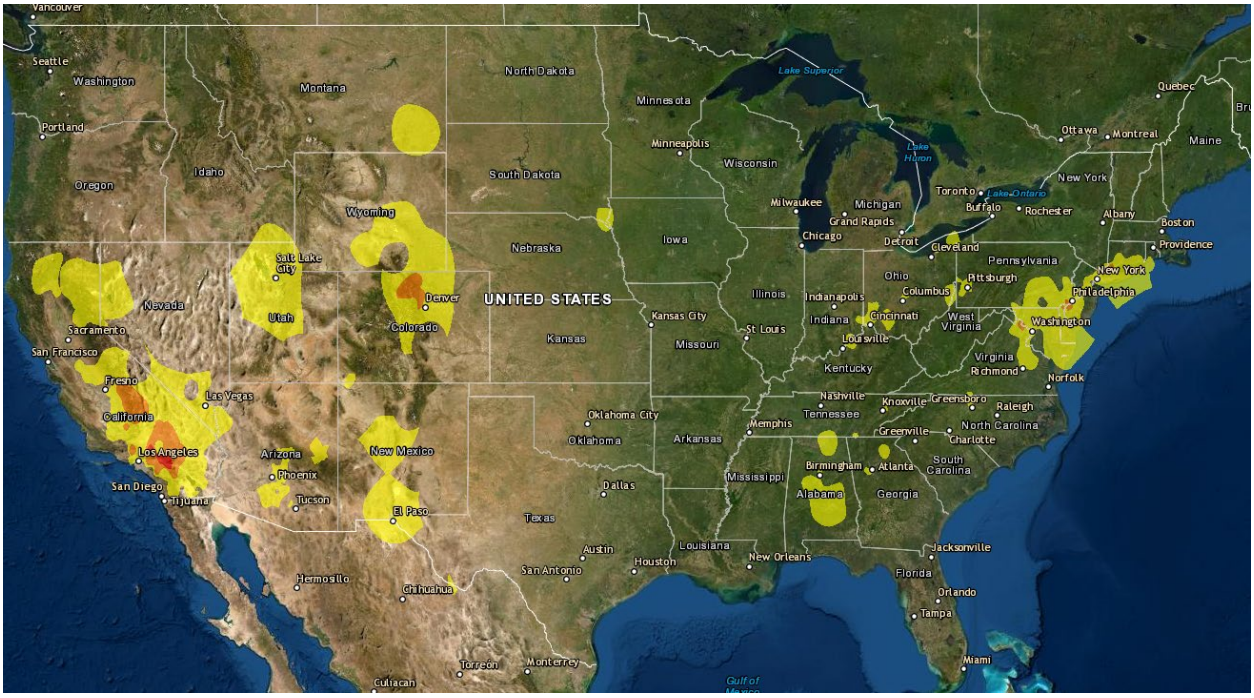


Figure 5. Combined Air Quality Index for the United States on July 21, 2020



Source: www.airnow.gov

How is Ozone Created?

Ground-level ozone is an air pollutant known to cause a number of 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/ .