Ozone National Ambient Air Quality Standard Health Exceedances on July 30, 2020

Exceedance Locations and Levels

On Thursday, July 30, 2020, 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.

Table 1. New Jersey Ozone Concentrations on 7/30/2020

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	45
Bayonne	60
Brigantine	No Data
Camden Spruce St	66
Chester	59
Clarksboro	63
Colliers Mills	57
Columbia	52
Flemington	57
Leonia	62
Millville	40
Monmouth University	54
Newark Firehouse	63
Ramapo	53
Rider University	62
Rutgers University	58
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 non-attainment areas, there were eleven (11) 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 7/30/2020

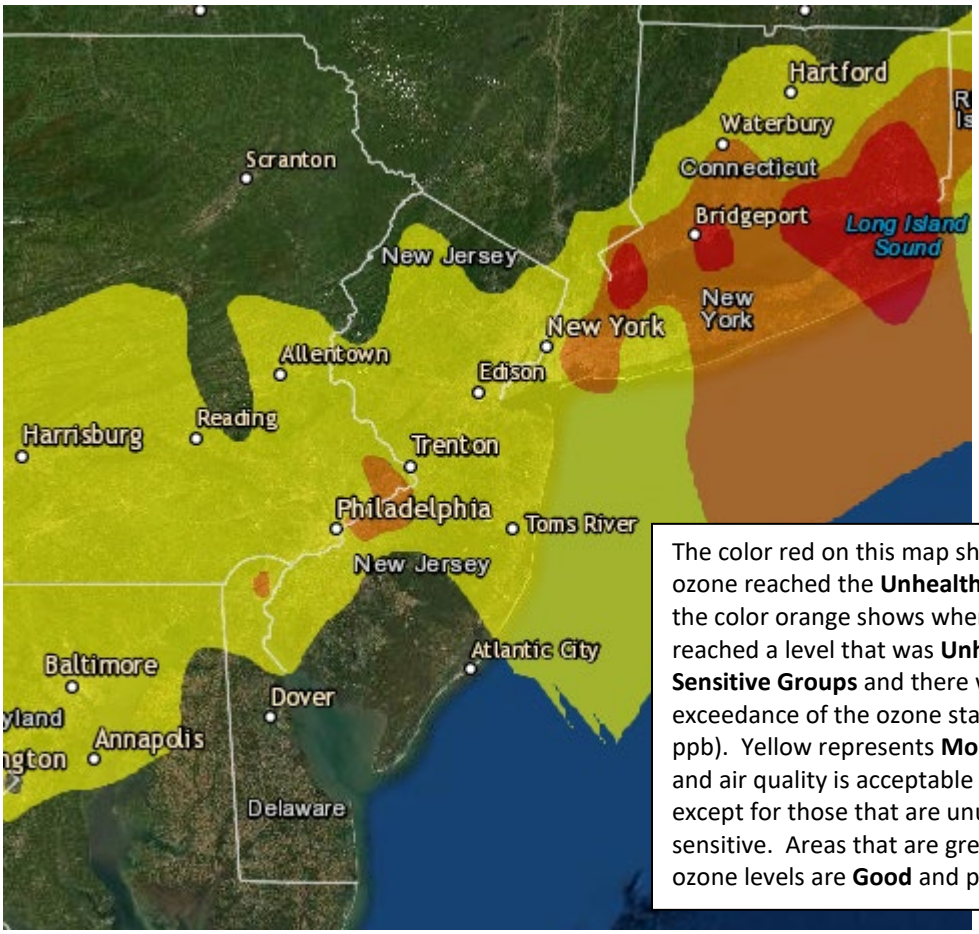
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	54
CT	Greenwich	90
CT	Madison-Beach Road	95
CT	Middletown-CVH-Shed	59
CT	New Haven	76
CT	Stratford	87
CT	Westport	77
DE	BCSP (New Castle Co.)	55
DE	BELLFNT2 (New Castle Co.)	66
DE	KILLENS (Kent Co.)	44
DE	LEWES (Sussex Co.)	47
DE	LUMS 2 (New Castle Co.)	56
DE	MLK (New Castle Co.)	71
DE	SEAFORD (Sussex Co.)	44
MD	Fair Hill	67
NY	Babylon	67
NY	Bronx - IS52	68
NY	CCNY	67
NY	Fresh Kills	62
NY	Holtsville	73
NY	Pfizer Lab	69
NY	Queens	78
NY	Riverhead	75
NY	Rockland Cty	49
NY	White Plains	63
PA	BRIS (Bucks Co.)	74
PA	CHES (Delaware Co.)	69
PA	NEWG (Chester Co.)	66
PA	NORR (Montgomery Co.)	66
PA	LAB (Philadelphia Co.)	68
PA	NEA (Philadelphia Co.)	69
PA	NEW (Philadelphia Co.)	75
	TOTAL EXCEEDANCES	11

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 30, 2020 NAAQS = 70 ppb
Connecticut	11
Delaware	2
Maryland	0
New Jersey	4
New York	7
Pennsylvania	4

Figure 1. Ozone Air Quality Index for July 30, 2020



The color red on this map shows where ozone reached the **Unhealthy** level. While, 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

On Thursday, July 30th, a stationary front was in place over the region. This frontal boundary allowed pollutants aloft to mix down to the surface to a previously polluted air mass. The favorable weather conditions in New York and Connecticut along with this mixing caused ozone levels to reach the unhealthy for sensitive groups (USG) category and the unhealthy category across these areas.

Early on July 30th, a stalled frontal boundary was located over southern New Jersey. During the morning hours, this frontal boundary moved slowly northward until it was draped across the region from Philadelphia, through the I-95 corridor and NYC, and into Connecticut. This caused winds out of the southwest for most of the region except for the New Jersey coast, which saw mainly southerly winds as well as a sea breeze. Temperatures across the area were above average, reaching the low to mid 90s. Abundant sunshine was observed in New York and the Connecticut coast. Everywhere else, mostly cloudy skies were observed, and a few scattered thunderstorms popped up in southern New Jersey throughout the afternoon. The stationary front allowed pollutants aloft to mix down and enhance ozone concentrations, with widespread moderate and an isolated area in Philadelphia that was able to reach the unhealthy for sensitive groups (USG) category. Due to the abundant sunshine in Connecticut and New York, widespread USG and unhealthy levels were reached. The southerly winds at the New Jersey shore and cloud cover over southern and northwestern New Jersey suppressed ozone formation in these areas, where ozone only reached the good category.

The frontal boundary allowed for polluted air aloft to mix down to an already polluted surface and enhance ozone concentrations in these areas. Parts of New York and Connecticut that reached the USG and unhealthy categories also experienced favorable weather conditions, which further enhanced ozone concentrations 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 28, 2020. 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 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)
CT	Greenwich	90
CT	Madison-Beach Road	95
CT	Stratford	87
CT	Westport	77
DE	MLK	71
NY	Holtsville	73
NY	Queens	78
NY	Riverhead	75
PA	Bristol	74
PA	NEW	75

Back trajectories from July 30th show that the widespread ozone exceedances in the Long Island Sound vicinity as well as isolated exceedances in portions of the southern non-attainment area were influenced by both localized transport along the I-95 corridor / Mid-Atlantic coast and the long range transport of previously polluted air from the Ohio River Valley / Great Lakes region. This transport along with favorable atmospheric conditions for ozone formation lead to multiple exceedances throughout the non-attainment area.

Surface level back trajectories (Figure 2) influencing locations in the southern non-attainment area as well as southwestern Connecticut and portions of western Long Island originated over Pennsylvania. Air then traveled southeastward toward the Chesapeake Bay region / Philadelphia metropolitan area respectively through late July 29th before making a turn northeast, traveling up the I-95 corridor into arrival. It is worth note, air traveled slowly and at the surface for much of its path, transporting not only emissions from cars, truck, and industry up the I-95 corridor, but previously polluted air from the Chesapeake Bay region. Meanwhile, air influencing eastern Long Island and the central Connecticut coast originated further south over North Carolina. Air then traveled directly north-northeast, along the coast into arrival. It is likely that a stalled frontal boundary off the U.S. east coast, as well as a seabreeze over New Jersey on July 29th, allowed for the pooling of previously polluted air offshore that was then transported north. Additionally, the Long Island Sound region saw elevated levels of ozone for several days leading up to this event, which may have also enhanced ozone levels at the surface.

In Figure 3, mid-level back trajectories (500 meters) originated in various parts of Ohio and West Virginia. One set of trajectories meandered in an easterly direction through the state of Pennsylvania. Towards the end of the trajectory, mid-level air traversed through the heavily industrialized metropolitan centers of Philadelphia and NYC, picking up ozone precursors along its path. A second set of trajectories encountered a stalled frontal boundary draped southwest to northeast over the mid-Atlantic, that greatly interfered with the mid-level flow. This caused the air parcels to stall and loop over the greater Washington D.C. area and portions of Virginia. 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 the day prior.

Figure 4 shows upper-level air (1500 meters) began in various areas in the Ohio River Valley and the Great Lakes Region. One set of trajectories traveled in a straight easterly direction through the Ohio River Valley and central Pennsylvania, where moderate air quality was observed the previous day. The parcels then traversed over the greater Philadelphia region, and NYC metropolitan area, picking up additional pollutants along the way, before arriving at their destinations. The second set of trajectories at this level were heavily influenced by a stalled frontal boundary that sat over the Mid-Atlantic throughout the trajectory's timeline. The upper air parcels traversed through the Delmarva region, which widespread moderate and isolated areas of unhealthy for sensitive groups ozone were observed the day prior, as shown in Figure 5. Towards the end of its path, upper level air traveled over the metropolitan regions of Philadelphia before arriving at their endpoints.

Figure 5 shows the National Air Quality Index observed on July 29th, the day prior to this high ozone event. As shown in the figure, moderate and isolated pockets of USG air quality were observed within the non-attainment area as well as portions of Pennsylvania and the Ohio River Valley. The transport of polluted air from upwind states to an already polluted air mass over the non-attainment area allowed for an abundance of ozone precursors in the region on July 30th. As a result, ozone concentrations at the surface quickly rose into the USG and unhealthy category leading to multiple exceedances within the non-attainment area.

Figure 2. 48-hour Back Trajectories for July 30, 2020 at 10 meters

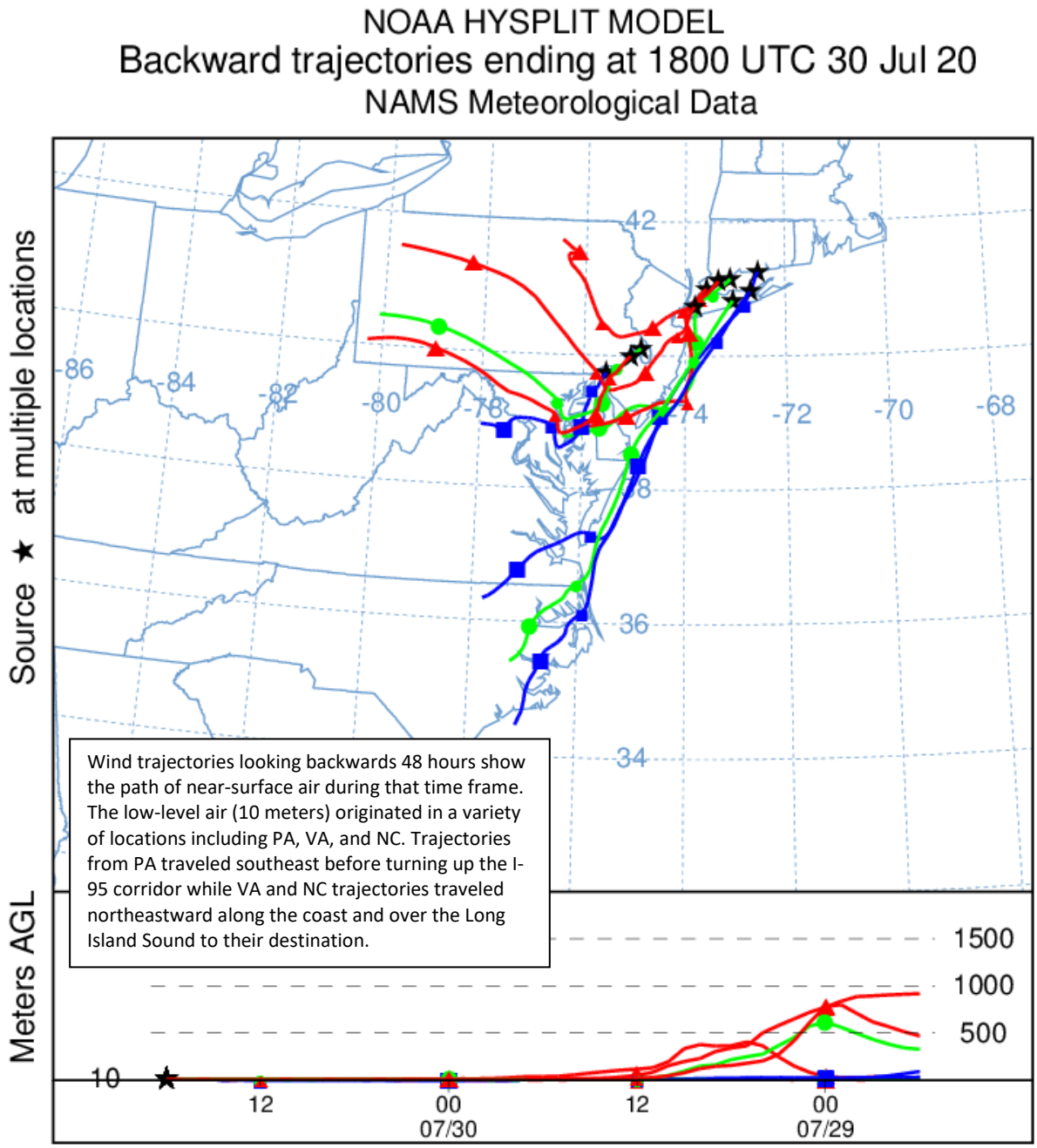


Figure 3. 48-hour Back Trajectories for July 30, 2020 at 500 meters

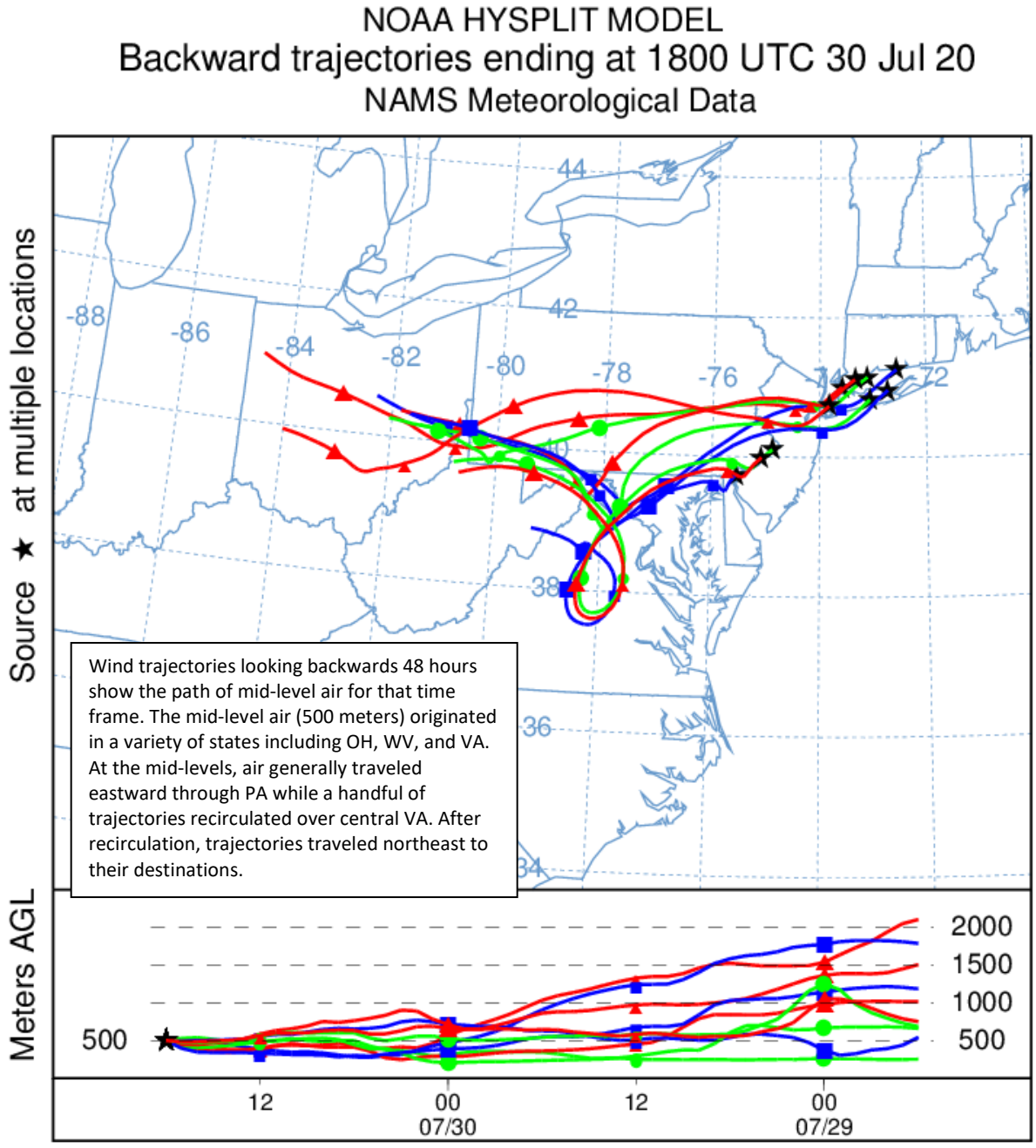


Figure 4. 48-hour Back Trajectories for July 30, 2020 at 1500 meters

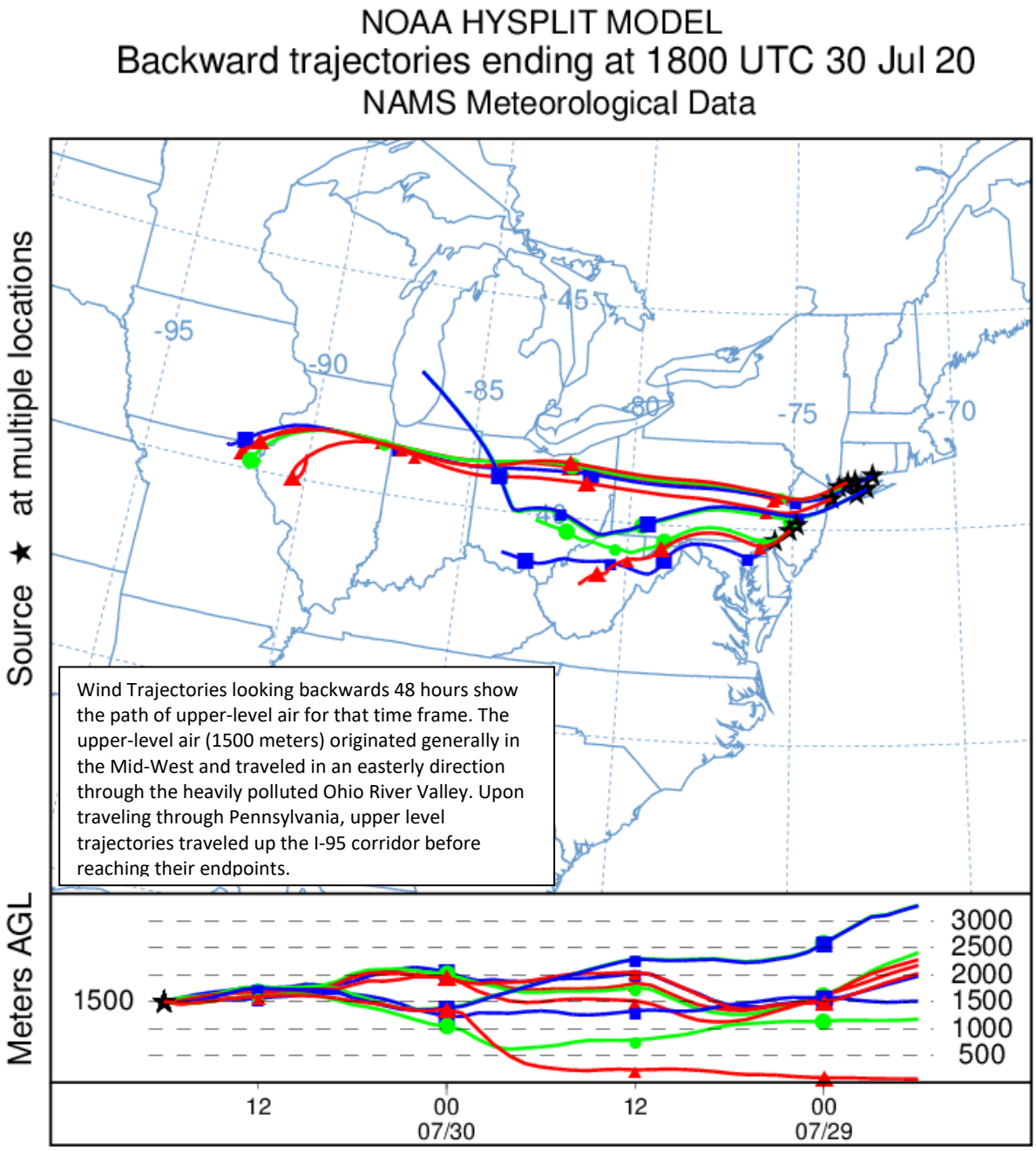
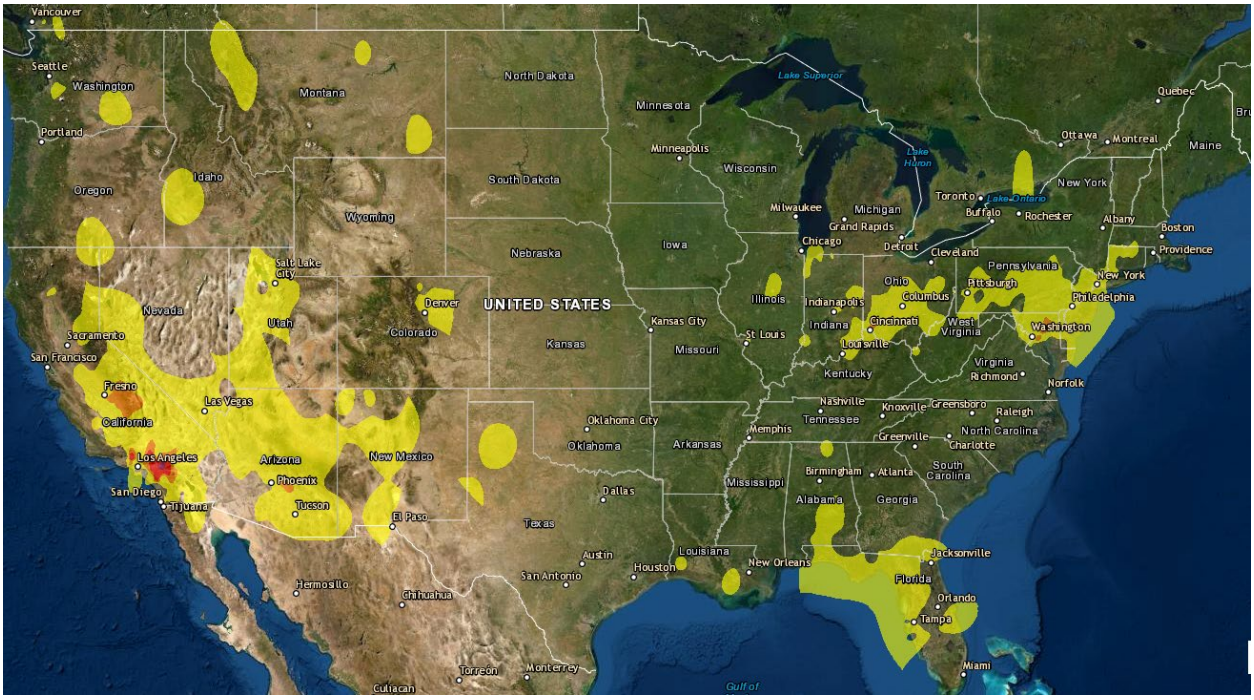


Figure 5. Combined Air Quality Index for the United States on July 29, 2020



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/ .