Ozone National Ambient Air Quality Standard Health Exceedances on August 6, 2018

Exceedance Locations and Levels

On Monday, August 6, 2018, there was one (1) exceedance 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 8-hr Maximum Ozone Concentrations on August 6, 2018

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	53
Bayonne	66
Brigantine	45
Camden Spruce St	50
Chester	52
Clarksboro	58
Colliers Mills	60
Columbia	39
Flemington	60
Leonia	76
Millville	44
Monmouth University	56
Newark Firehouse	61
Ramapo	No Data
Rider University	60
Rutgers University	61
Washington Crossing*	60
TOTAL EXCEEDANCES	1

*The Washington Crossing station is operated and maintained by EPA as part of the nationwide Clear Air Status and Trends Network (CASTNET).

From the out-of-state stations within New Jersey's ozone non-attainment areas, there were nine (9) exceedances of the ozone NAAQS. See Table 2.

Table 2. 8-hr Maximum Ozone Concentrations for Out-of-State Monitoring Stations in New Jersey's Ozone Non-Attainment Areas on August 6, 2018

STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	51
CT	Greenwich	86

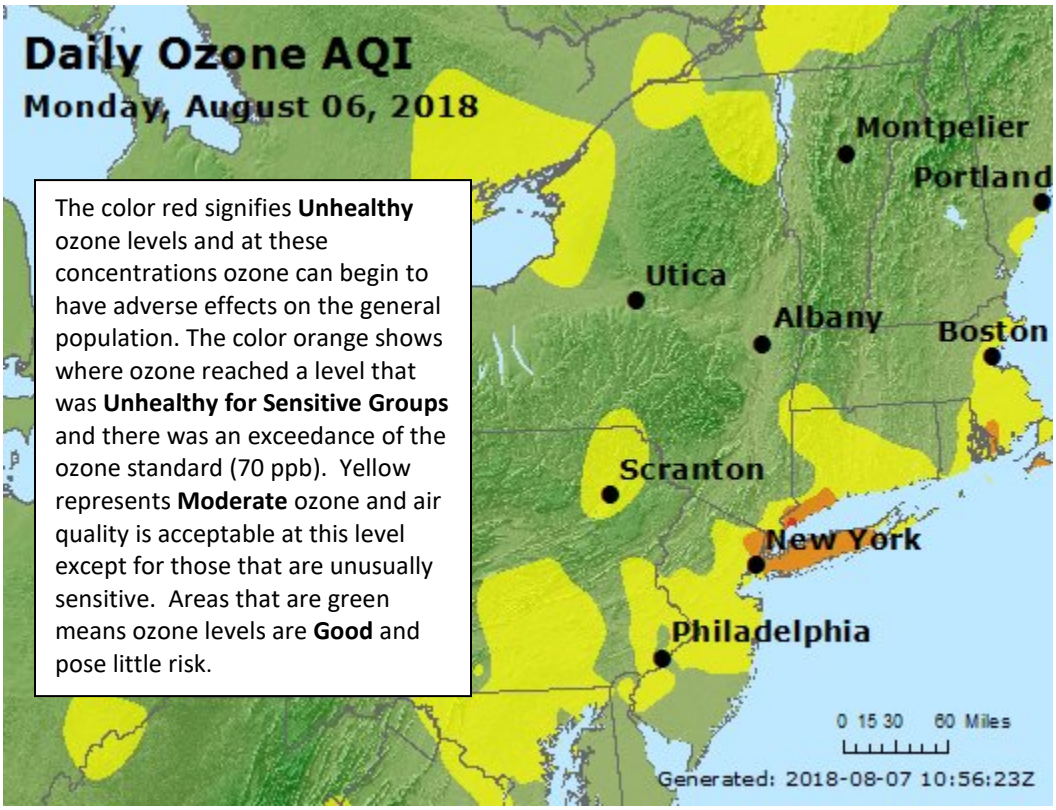
CT	Madison-Beach Road	70
CT	Middletown-CVH-Shed	58
CT	New Haven	63
CT	Stratford	74
CT	Westport	77
DE	BCSP (New Castle Co.)	46
DE	BELLFNT2 (New Castle Co.)	52
DE	KILLENS (Kent Co.)	41
DE	LEWES (Sussex Co.)	47
DE	LUMS 2 (New Castle Co.)	53
DE	MLK (New Castle Co.)	60
DE	SEAFORD (Sussex Co.)	44
MD	Fair Hill	57
NY	Babylon	74
NY	Bronx - IS52	71
NY	CCNY	74
NY	Holtsville	76
NY	Pfizer Lab	77
NY	Queens	71
NY	Riverhead	70
NY	Rockland Cty	43
NY	White Plains	65
NY	Fresh Kills	62
PA	BRIS (Bucks Co.)	63
PA	CHES (Delaware Co.)	59
PA	NEWG (Chester Co.)	49
PA	NORR (Montgomery Co.)	55
PA	LAB (Philadelphia Co.)	52
PA	NEA (Philadelphia Co.)	59
PA	NEW (Philadelphia Co.)	56
	TOTAL EXCEEDANCES	9

The number of days in 2018 on which exceedances of the ozone NAAQS were recorded for all the states is summarized in Table 3. Figure 1 shows graphically the regions ozone concentrations on August 6, 2018.

Table 3. Number of Days Ozone NAAQS was Exceeded in NJ's Non-Attainment Areas in 2018

STATE	# of Days NAAQS was Exceeded January 1 – August 6, 2018 NAAQS = 70 ppb
Connecticut	16
Delaware	8
Maryland	6
New Jersey	18
New York	16
Pennsylvania	12

Figure 1. Ozone Air Quality Index for August 6, 2018



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

Light surface winds associated with high pressure allowed for localized transport in and around the New York City metropolitan area. In addition, a surface trough created a mechanism for polluted air from the Great Lakes to mix down to the surface. The combination of these features led to exceedances in the northern nonattainment area on August 6th, 2018.

Surface high pressure was centered over the southeastern United States beginning in the afternoon hours on Saturday August 4th. This set up remained in place for several days propelling light winds, mostly sunny skies, and favorable conditions for ozone formation. On Sunday August 5th, a surface trough developed along the eastern United States where it remained through Monday allowing for polluted air aloft to mix down to the surface. The surface trough crossed through northeastern New Jersey, New York City and Connecticut which is consistent with exceedance locations.

During the afternoon hours on August 6th, daytime heating and increased humidity along with the previously mentioned surface trough helped to create enough instability for a large cluster of thunderstorm cells to develop in southern New Jersey. As a result, strong gusty winds radiated from the center of the thunderstorm cells which appeared to have a cleaning effect on the southern half of New Jersey. In locations that did not receive rain, a mostly sunny sky turned partly sunny helping to limit ozone formation for many locations throughout the state.

The exceedance locations being exclusive to northern New Jersey, New York and Connecticut is likely a result of polluted air at higher levels mixing down to the surface and combining with emissions at the surface.

Where Did the Air Pollution that Caused Ozone Come From?

Figures 2, 3, and 4 show the back trajectories starting at different wind heights for the monitored exceedance August 6, 2018. The figures illustrate where the winds came from during the 48 hours preceding the high ozone event. Ten (10) monitoring stations with an 8-hr ozone exceedance were used to run back trajectories. The selected sites and the maximum 8-hr ozone levels recorded are listed in Table 4 below:

Table 4. Monitoring Stations with 8-hr Ozone Exceedances that Were Selected to Run 48-hr Back Trajectories

STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Greenwich	86
CT	Stratford	74
CT	Westport	77
NJ	Leonia	76
NY	Babylon	74
NY	Bronx – IS52	71
NY	CCNY	74
NY	Holtsville	76
NY	Pfizer Lab	77

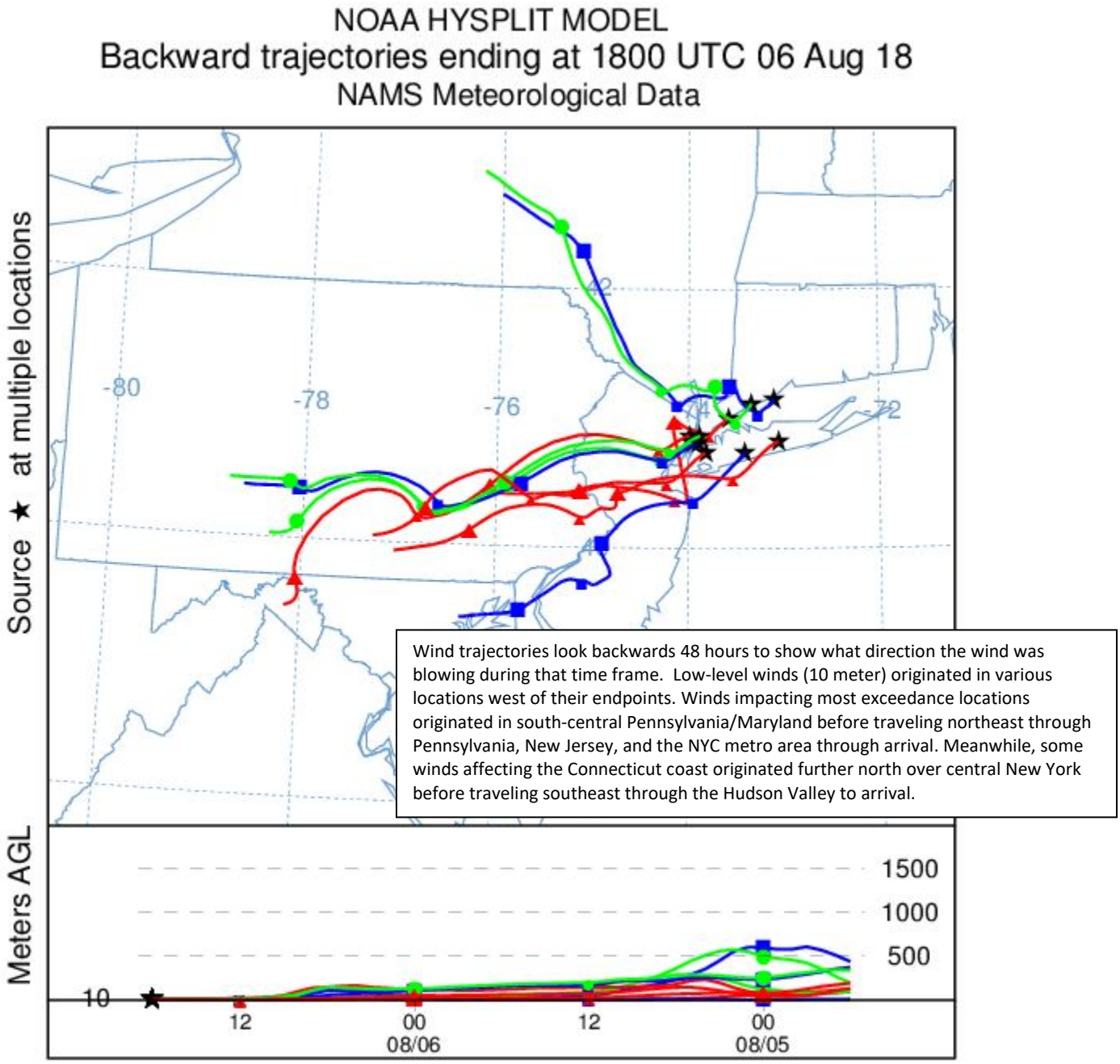
NY	Queens	71

The back trajectories below show that air traveled through areas of moderate levels of ozone in the days leading up to this exceedance, at all levels of the atmosphere. In the presence of favorable weather conditions indicated above, this air mass appears to have enhanced any locally generated ozone throughout the northern nonattainment area on August 6th.

Surface-level back trajectories (Figure 2) show that winds originated in various locations west of their endpoints. Surface-level back trajectories impacting most exceedance locations (New York City metropolitan area, portions of Long Island, and Greenwich, CT) look to have originated over south-central Pennsylvania/western Maryland before traveling east-northeast through eastern Pennsylvania, northern New Jersey and portions of the New York City metropolitan area through arrival. There is one surface-level back trajectory indicating that air impacting other portions of Long Island originated further south near the Chesapeake Bay and traveled northeast along the I-95 corridor to arrival. Finally, other surface-level back trajectories on this day show that air impacting the other locations along the Connecticut coastline may have originated further north, over central New York before traveling southeast through the Hudson Valley to its endpoint. It is worth note that in all scenarios, air traveled along the surface for much of its path picking up emissions from cars, trucks, and industry along the way. Mid-level back trajectories (Figure 3) show that air originated in the Ohio River Valley and traveled east through Pennsylvania (or portions of western New York), northern New Jersey, and the New York City metropolitan area through arrival. Finally, upper-level back trajectories (Figure 4) show that air originated over the Great Lakes region or as far as southern Ontario. Air then traveled southeast through New York, northeastern Pennsylvania, northern New Jersey/NYC metropolitan area through arrival.

Figure 5 below shows the national ozone levels on August 5th, the day leading up to this exceedance event. Scattered moderate ozone levels can be seen throughout the Great Lakes Region as well as over portions of western New York and the Mid-Atlantic on this day. Based on back trajectories, at all levels of the atmosphere, it is likely this air was transported into our region, enhancing any locally generated ozone in the northern nonattainment area on August 6th.

Figure 2. 48-hour Back Trajectories for August 6, 2018 at 10 meters



Wind trajectories look backwards 48 hours to show what direction the wind was blowing during that time frame. Low-level winds (10 meter) originated in various locations west of their endpoints. Winds impacting most exceedance locations originated in south-central Pennsylvania/Maryland before traveling northeast through Pennsylvania, New Jersey, and the NYC metro area through arrival. Meanwhile, some winds affecting the Connecticut coast originated further north over central New York before traveling southeast through the Hudson Valley to arrival.

Figure 3. 48-hour Back Trajectories for August 6, 2018 at 500 meters

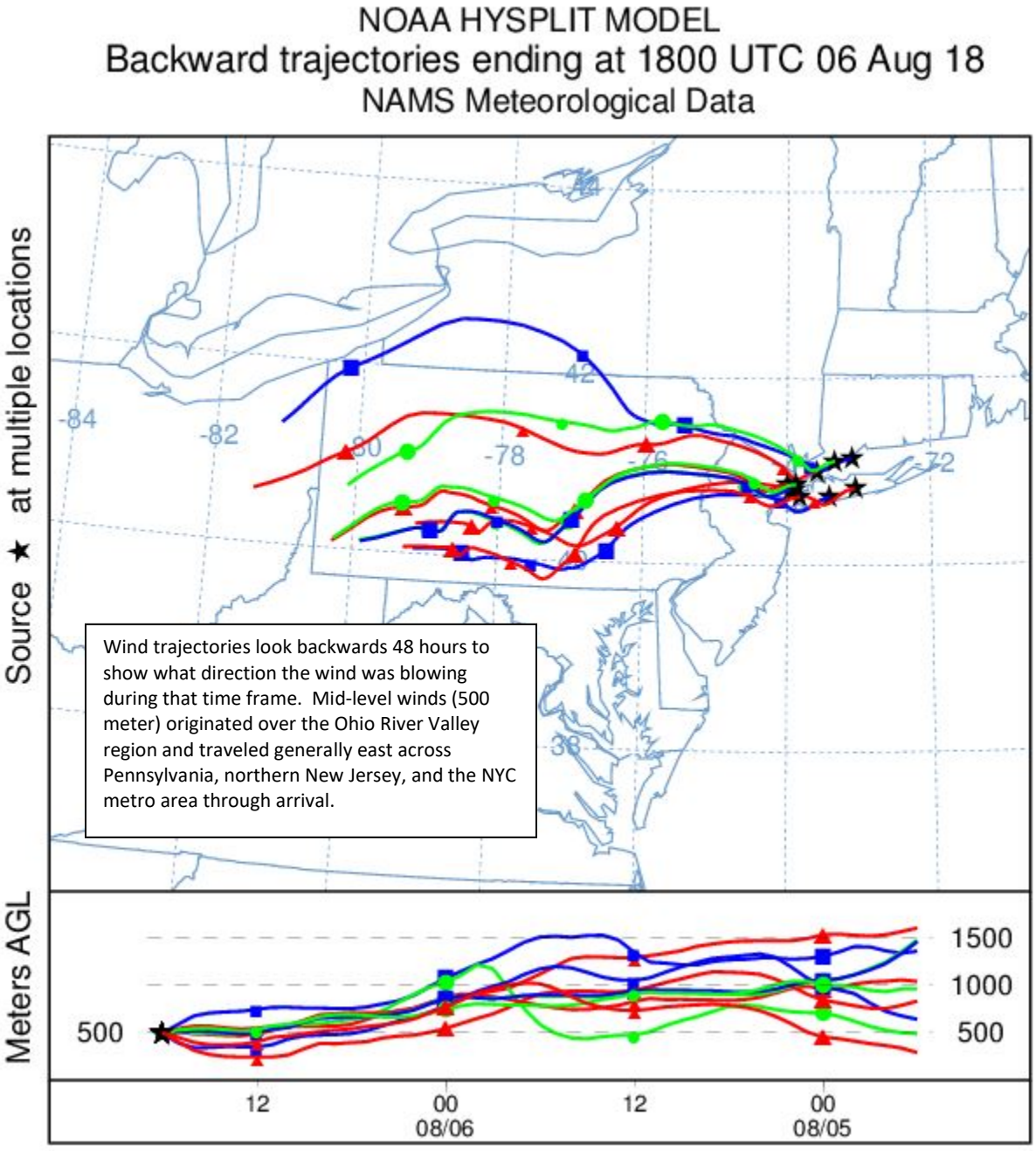


Figure 4. 48-hour Back Trajectories for August 6, 2018 at 1500 meters

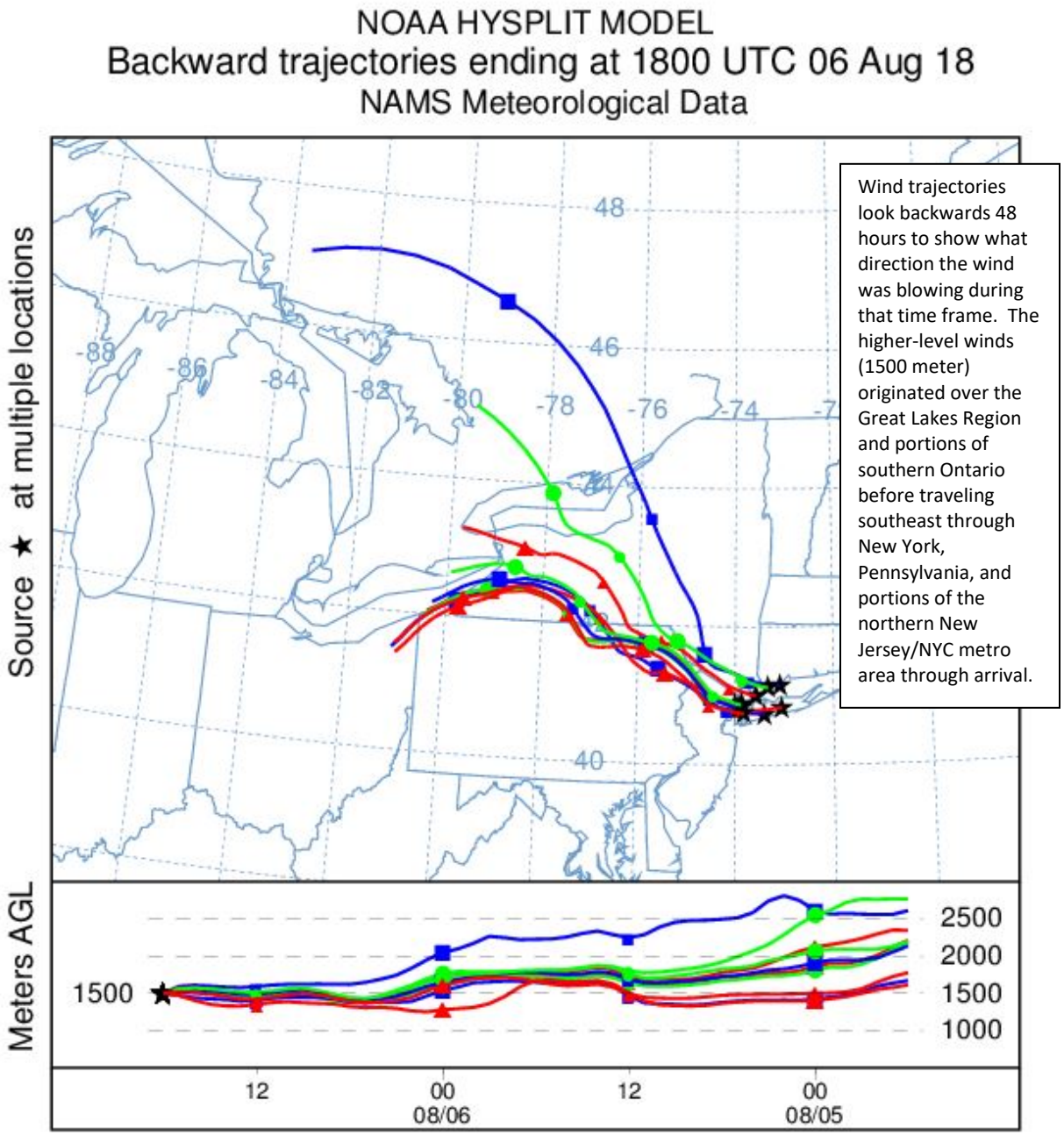
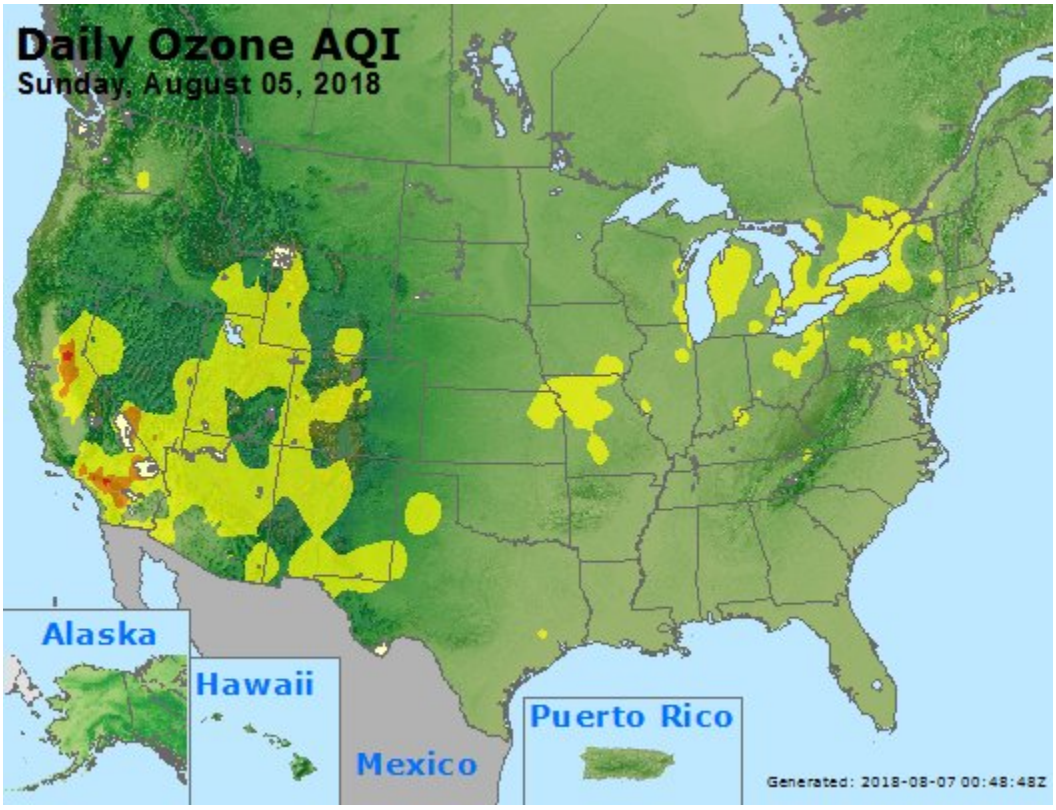


Figure 5. Ozone Air Quality Index for the United States on August 5, 2018



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

The "What's Your Air Quality Today?" page at http://www.nj.gov/dep/cleanairnj/ tells you how to sign up to receive notifications and find out when your local air has reached unhealthy ozone levels.