Ozone National Ambient Air Quality Standard Health Exceedances on August 8, 2019

Exceedance Locations and Levels

On Thursday, August 8, 2019, 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 8/8/2019

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	58
Bayonne	52
Brigantine	45
Camden Spruce St	59
Chester	53
Clarksboro	57
Colliers Mills	57
Columbia	44
Flemington	54
Leonia	57
Millville	61
Monmouth University	58
Newark Firehouse	56
Ramapo	49
Rider University	52
Rutgers University	58
Washington Crossing*	52
TOTAL EXCEEDANCES	0

*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 two (2) exceedance 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 8/8/2019

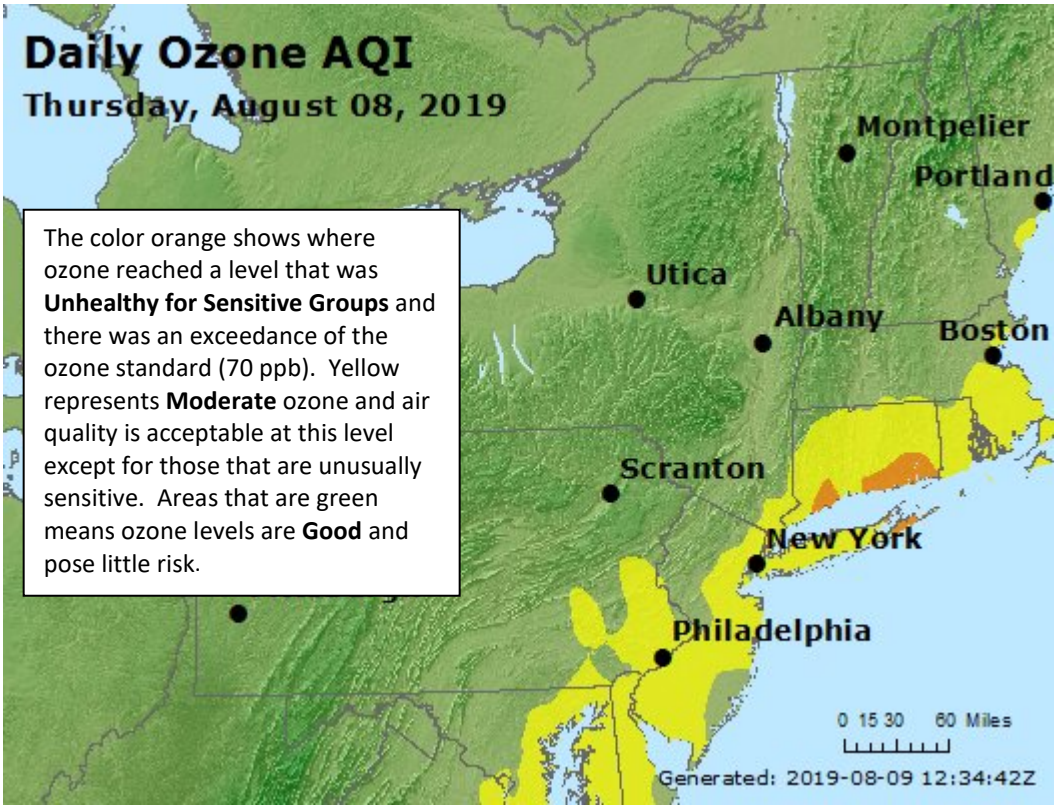
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	60
CT	Greenwich	66
CT	Madison-Beach Road	84
CT	Middletown-CVH-Shed	65
CT	New Haven	66
CT	Stratford	80
CT	Westport	70
DE	BCSP (New Castle Co.)	53
DE	BELLFNT2 (New Castle Co.)	60
DE	KILLENS (Kent Co.)	58
DE	LEWES (Sussex Co.)	51
DE	LUMS 2 (New Castle Co.)	58
DE	MLK (New Castle Co.)	60
DE	SEAFORD (Sussex Co.)	61
MD	Fair Hill	55
NY	Babylon	62
NY	Bronx - IS52	60
NY	CCNY	54
NY	Fresh Kills	55
NY	Holtsville	58
NY	Pfizer Lab	58
NY	Queens	65
NY	Riverhead	67
NY	Rockland Cty	53
NY	White Plains	60
PA	BRIS (Bucks Co.)	61
PA	CHES (Delaware Co.)	61
PA	NEWG (Chester Co.)	53
PA	NORR (Montgomery Co.)	56
PA	LAB (Philadelphia Co.)	57
PA	NEA (Philadelphia Co.)	59
PA	NEW (Philadelphia Co.)	62
	TOTAL EXCEEDANCES	2

The number of days in 2019 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 2019

STATE	# of Days NAAQS was Exceeded January 1 – August 8, 2019 NAAQS = 70 ppb
Connecticut	17
Delaware	3
Maryland	2
New Jersey	12
New York	10
Pennsylvania	8

Figure 1. Ozone Air Quality Index for August 8, 2019



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, August 8, 2019, the region was between two frontal boundaries, which caused warm temperatures and mostly sunny to partly cloudy skies. Isolated clouds and rain showers suppressed ozone formation across most of the region, however there were locations in Connecticut that remained mostly sunny for much of the day and led to ozone reaching the unhealthy for sensitive groups (USG) category.

Early on Thursday morning, a cold front pushed through the area from the west and was located off shore by 8 am. This front brought widespread severe thunderstorms to the region the previous afternoon and into the overnight hours, cleaning much of the air mass. The day started off with fog and low clouds across New Jersey. The clouds lifted early and left much of the region with clear, sunny skies and warm temperatures in the mid to upper 80s. As the day progressed, ample moisture and daytime heating caused scattered clouds to form over the nonattainment area. A pre-frontal surface trough developed. It stretched from western Connecticut through central New Jersey, and pushed eastward, which sparked some additional clouds and even some rain showers in locations along the frontal boundary. Meanwhile, another cold front was quickly moving southeastward from the Great Lakes region, putting the area between two frontal systems, causing winds to flow in a west-southwest direction across New Jersey and a southwesterly direction along Connecticut and Long Island.

These favorable meteorological conditions along with the mixing of polluted air down to the surface from the pre-frontal trough allowed ozone concentrations to exceed the 8-hour average NAAQS in Madison and Stratford, CT. In other locations, cloud cover and rain showers were able to suppress ozone formation, resulting in the isolated exceedances in only Connecticut.

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 exceedances on August 8, 2019. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone exceedances. Two (2) monitoring stations with an 8-hour average ozone exceedance were used to run back trajectories. The selected sites and 8-hour average ozone levels recorded are listed in Table 4 below.

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

STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Madison-Beach Road	84
CT	Stratford	80

Backward trajectories from August 8th show that air at all levels was influenced by weak high pressure located between two frontal boundaries the day prior to this exceedance event. As the weak cold front mentioned above pushed through the non-attainment region early on Thursday, winds remained out of the south-southwest resulting in transport along the I-95 corridor and New York City metropolitan area. These favorable meteorological conditions along with the transport of ozone precursors resulted in two exceedances of the 8-hour average ozone standard in coastal Connecticut.

In Figure 2, surface level air originated off the coast of North Carolina and traveled in a predominantly northerly direction along the Mid-Atlantic coast the day prior to the exceedances. Early on Thursday, the surface air took a sharp turn towards the northeast after the passage of a cold front, transporting pollutants along the I-95 corridor, New York City metropolitan area, and portions of Long Island before reaching coastal Connecticut. The air mass was able to pick up emissions from cars, trucks, local industry, and power plants, which may have included peak demand electric generating units (EGUs), from the New York City metropolitan area and transport them directly to the Connecticut coastline.

Looking at mid-levels (Figure 3), the air mass at 500 meters originated over the northern Great Lakes region and was transported in a southeasterly direction for most of its path. This air mass traveled southwest with a general sinking motion under the influence of high pressure. The air mass passed over portions of western New York State and northern Pennsylvania, including the cities of Buffalo and Scranton, transporting additional emissions from local industry and power plants before arriving in the New York City metropolitan area. Early Thursday, this sinking mid-level air took a turn towards the northeast, adding industrial and power plant emissions from the New York City metropolitan area to an increasingly polluted air mass at the surface. Air at upper levels (Figure 4) originated over the Great Lakes region as well and followed a similar path over western New York State and northern Pennsylvania before entering the Lower Hudson Valley region and eventually the exceedance locations. The air mass also showed a general sinking motion along its path, causing additional pollutants to mix down towards the surface.

Figure 5 shows the national Air Quality Index observed on August 7th, the day prior to the exceedance event. As shown in the figure, a few isolated areas in the Great Lakes region and portions of Connecticut reached the moderate category the day before, indicating that previously polluted air was transported to the surface from upper levels. Despite the lack of widespread moderate and unhealthy for sensitive groups air quality in the region, southwesterly winds were able to transport a plume of ozone precursors from the New York City metropolitan area toward the Connecticut coast at all levels. Along with favorable meteorological conditions mentioned above, ground level ozone concentrations were able to reach well into the USG category at isolated locations of the Connecticut coastline.

Figure 2. 48-hour Back Trajectories for August 8, 2019 at 10 meters

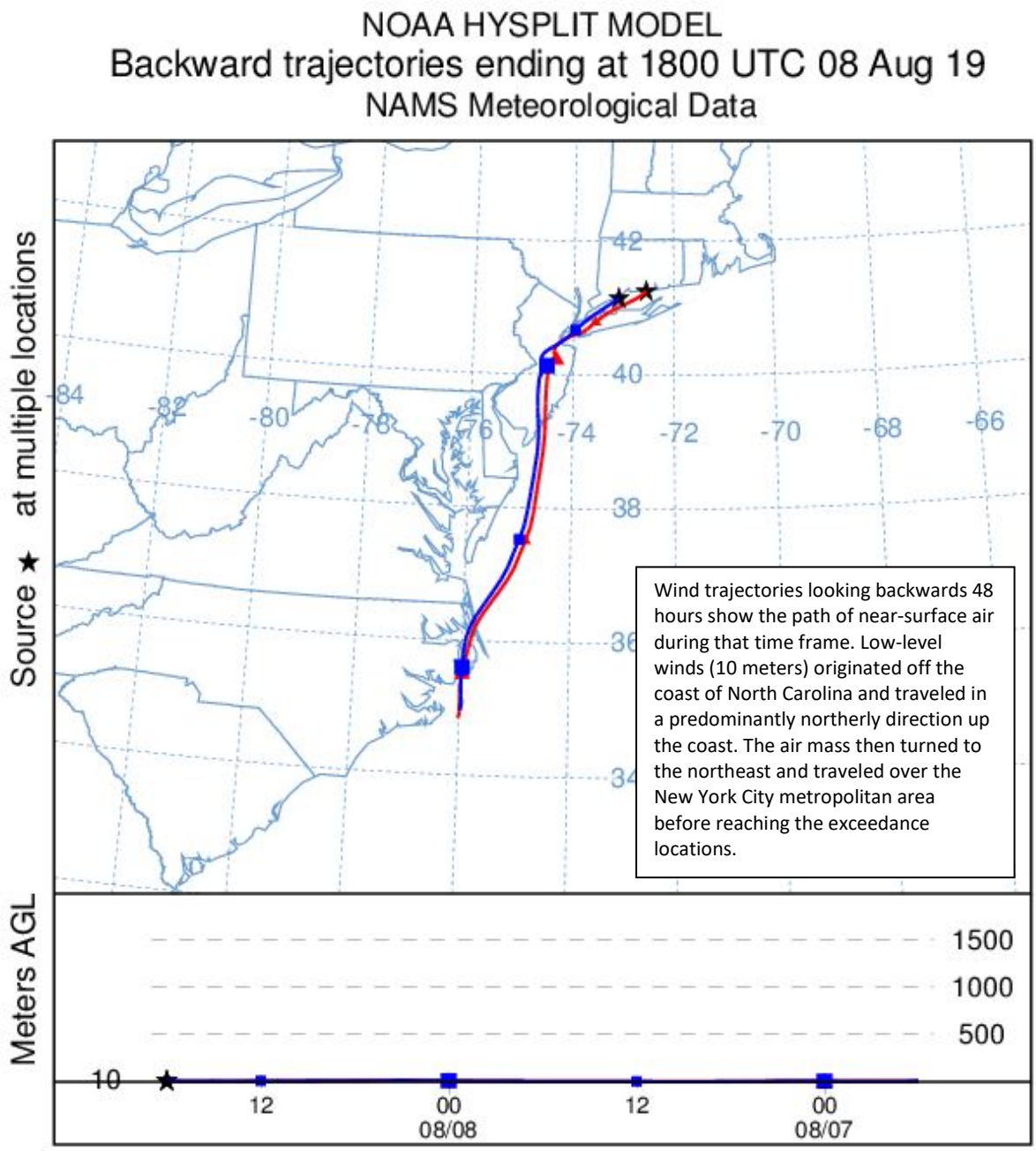


Figure 3. 48-hour Back Trajectories for August 8, 2019 at 500 meters

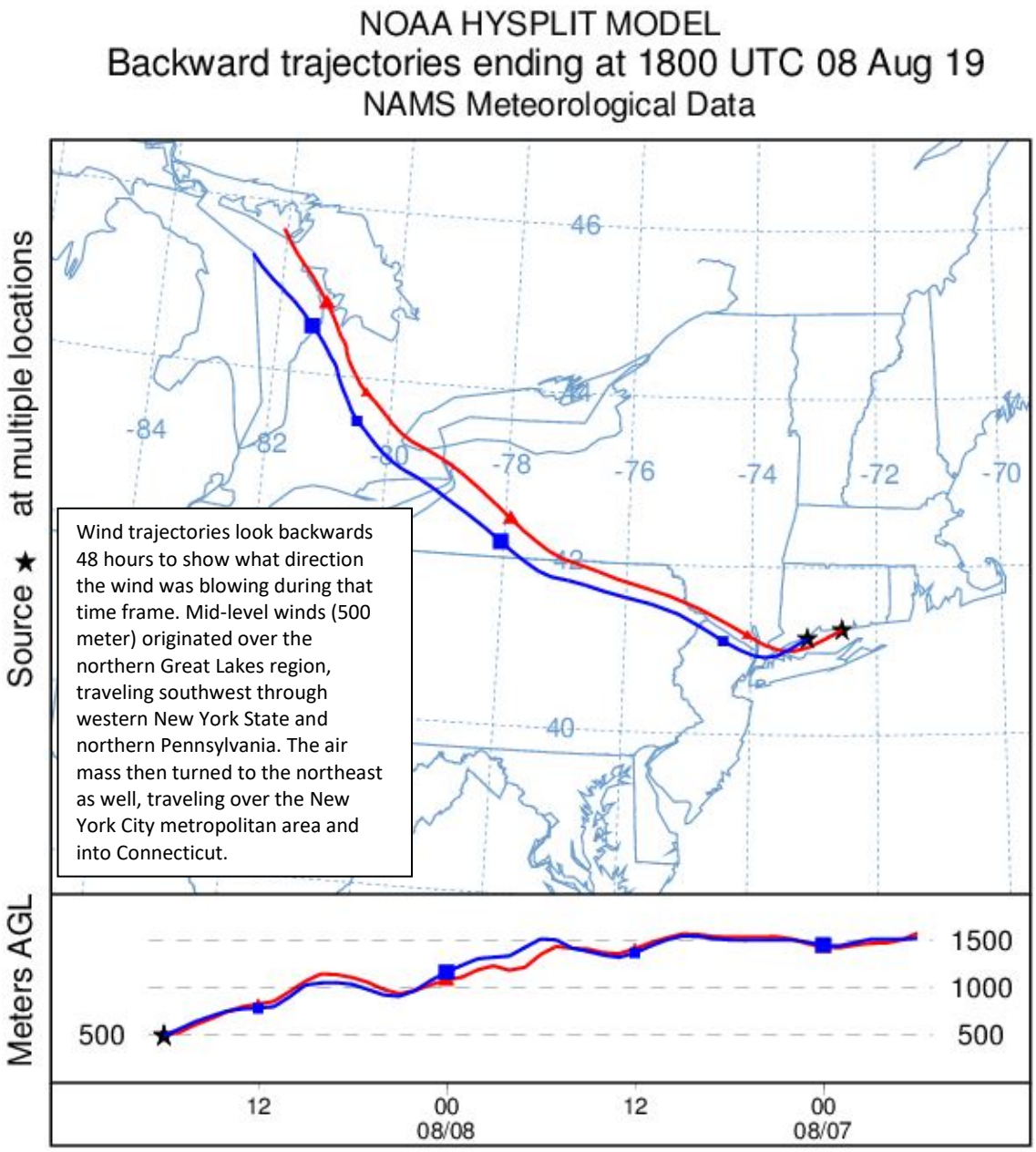


Figure 4. 48-hour Back Trajectories for August 8, 2019 at 1500 meters

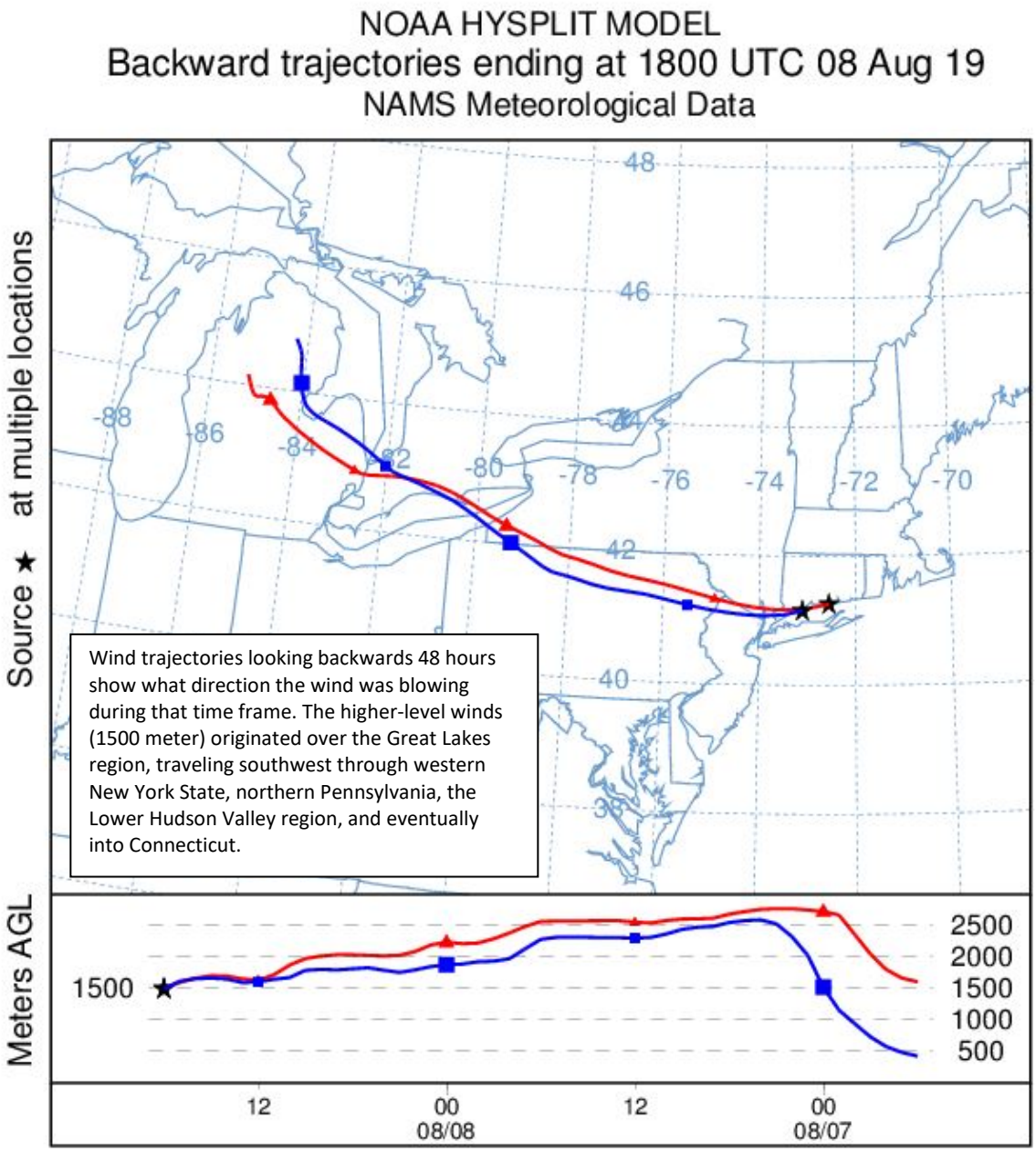
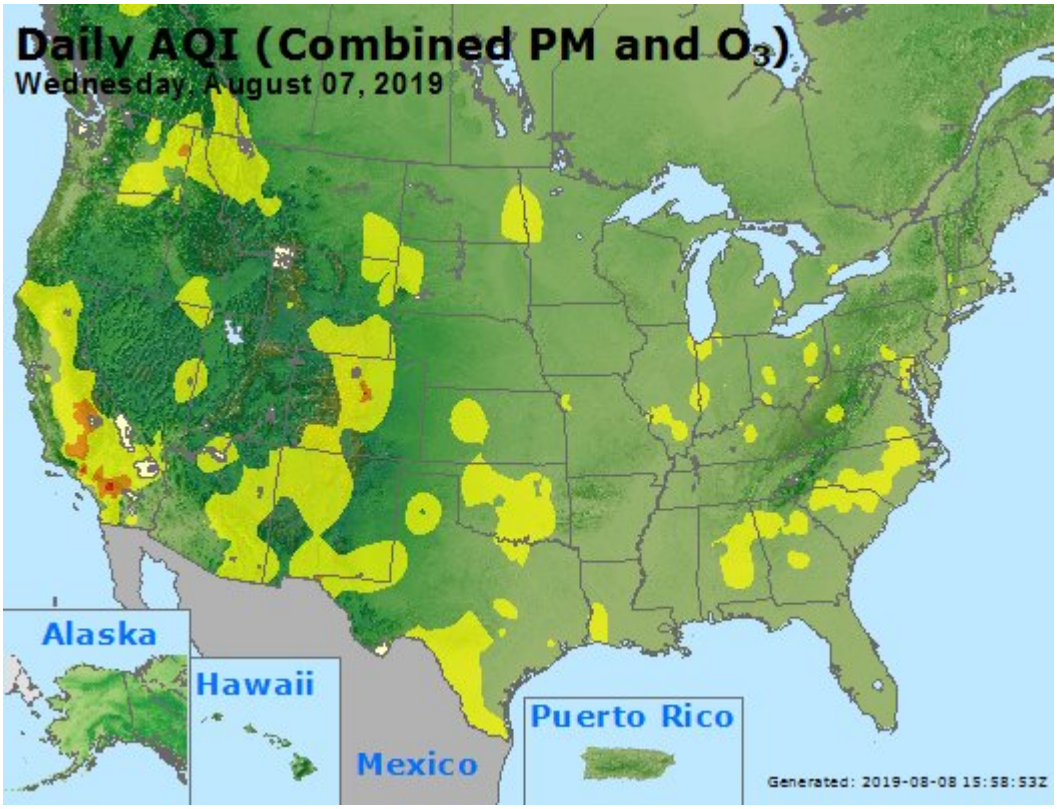


Figure 5. Combined Air Quality Index for the United States on August 7, 2019



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

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.