Ozone National Ambient Air Quality Standard Health Exceedances on July 26, 2019

Exceedance Locations and Levels

On Friday, July 26, 2019, 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 Ozone Concentrations on 7/26/2019

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	49
Bayonne	59
Brigantine	53
Camden Spruce St	58
Chester	45
Clarksboro	66
Colliers Mills	48
Columbia	40
Flemington	48
Leonia	73
Millville	55
Monmouth University	67
Newark Firehouse	60
Ramapo	47
Rider University	51
Rutgers University	64
Washington Crossing*	43
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 no 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 7/26/2019

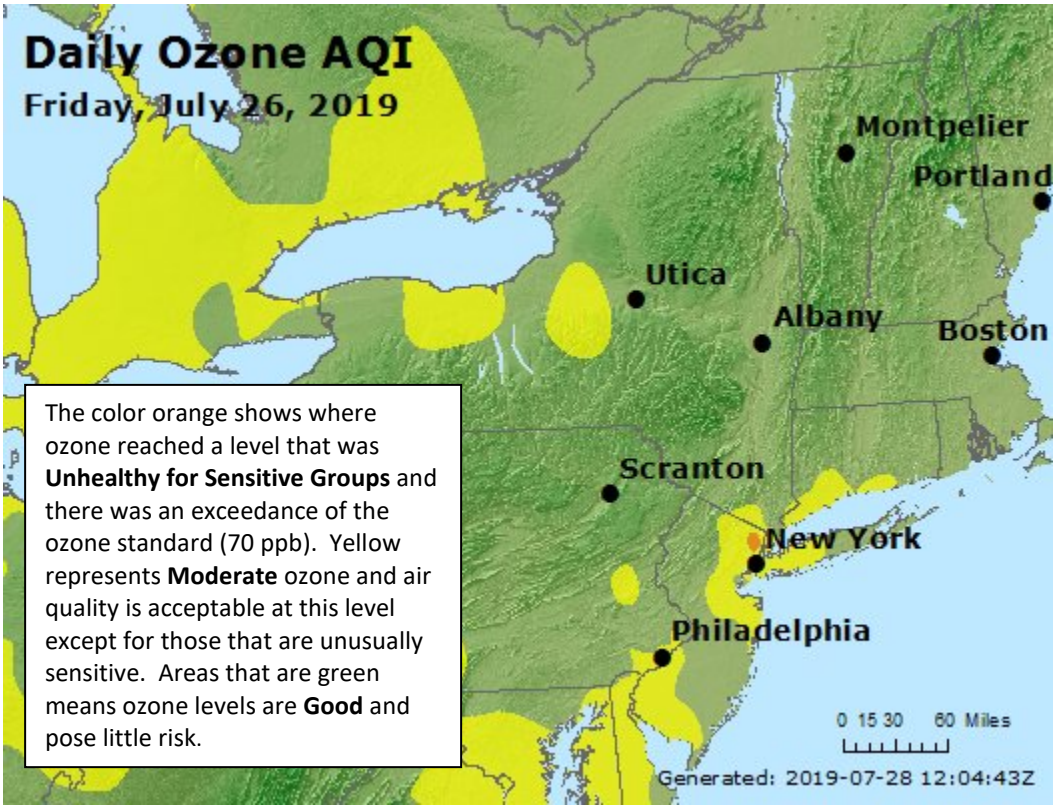
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	53
CT	Greenwich	57
CT	Madison-Beach Road	58
CT	Middletown-CVH-Shed	42
CT	New Haven	54
CT	Stratford	61
CT	Westport	60
DE	BCSP (New Castle Co.)	48
DE	BELLFNT2 (New Castle Co.)	62
DE	KILLENS (Kent Co.)	56
DE	LEWES (Sussex Co.)	51
DE	LUMS 2 (New Castle Co.)	61
DE	MLK (New Castle Co.)	59
DE	SEAFORD (Sussex Co.)	56
MD	Fair Hill	46
NY	Babylon	56
NY	Bronx - IS52	60
NY	CCNY	64
NY	Fresh Kills	53
NY	Holtsville	52
NY	Pfizer Lab	60
NY	Queens	60
NY	Riverhead	43
NY	Rockland Cty	53
NY	White Plains	51
PA	BRIS (Bucks Co.)	52
PA	CHES (Delaware Co.)	65
PA	NEWG (Chester Co.)	51
PA	NORR (Montgomery Co.)	47
PA	LAB (Philadelphia Co.)	53
PA	NEA (Philadelphia Co.)	55
PA	NEW (Philadelphia Co.)	55
	TOTAL EXCEEDANCES	0

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 – July 26, 2019 NAAQS = 70 ppb
Connecticut	11
Delaware	3
Maryland	2
New Jersey	9
New York	8
Pennsylvania	5

Figure 1. Ozone Air Quality Index for July 26, 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

A broad, surface high pressure system was anchored closely overhead on Friday, July 26th and spanned a large portion of the eastern United States. This large high pressure remained in place through the following days providing light and variable winds, abundant sunshine, and temperatures reaching the mid-80s. Favorable weather conditions in combination with localized transport from the New York City metropolitan area led to an exceedance at Leonia, New Jersey.

The location of the center of high pressure is particularly important as it led to recirculation of air and pollutants at the surface. Historically, this pattern generates a gentle sinking motion that compresses pollutants at ground level. This exceedance was exclusive to northern New Jersey due to a sea breeze that developed in southern New Jersey and pushed well inland throughout the day. This strong sea breeze provided cleaner air to southern locations limiting ozone concentrations in this area. A weaker sea breeze was also noted over Long Island and coastal Connecticut and provided the same cleansing effect.

Based on meteorological data from across the region, the observed exceedance on July 26th can be attributed to favorable weather conditions, recirculation of air at the surface, and locally generated emissions being transported into the non-attainment area.

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 on July 26, 2019. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. One (1) monitoring station with an 8-hour average ozone exceedance was used to run back trajectories. The selected site and 8-hour average ozone levels recorded are listed in Table 4 below.

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)
NJ	Leonia	73

Looking at the back trajectories (Figures 2-4), we can see that air at the surface and at upper levels followed a clockwise circulation around high pressure centered over the Ohio River Valley in the days leading up to the exceedance. The transport of previously polluted air combined with favorable meteorological conditions caused ozone to exceed the 8-hour average NAAQS at Leonia, New Jersey.

Looking at Figure 2, we can see that air at the surface originated in eastern New York State and followed a counter-clockwise rotation from a departing low-pressure system off the New England coast. High pressure quickly pushed east over the Ohio River Valley, causing winds to shift out of the north. The surface air was then transported south through New York State, picking up emissions from cars and trucks along the New York State Thruway. The air then recirculated over the Lower Hudson Valley and New York City metropolitan area before reaching Leonia. Along this path, the air picked up additional

emissions from cars, trucks, local industry, and power plants, including peak demand electric generating units (EGUs). The sinking air from overhead high pressure trapped these additional emissions from the New York City metropolitan area over northeastern New Jersey.

Air at mid-levels (Figure 3) originated over southeastern Vermont before traveling southward under the influence of high pressure over the Ohio River Valley. The air traveled through Hartford and New Haven, Connecticut and Long Island before making a sharp turn to the northeast as a result of southwest winds from dominating high pressure. As the air mass entered the New York City metropolitan area, high pressure overhead caused winds to become mostly calm, resulting in a slow recirculation of polluted air around the non-attainment region.

Air at upper levels (Figure 4) originated over Southern Ontario before following a predominantly southeasterly flow around high pressure, which was centered over the Ohio River Valley. The air mass traveled southeast with a gradual sinking motion over Lake Ontario and New York State before turning southward over the Lower Hudson Valley region and arriving at the exceedance location. NOAA visible satellite imagery and the HRRR model both indicated that Canadian wildfire smoke was transported to the region through New York State at upper levels, which may have enhanced ozone production as result of increased VOC concentrations.

Figure 5 shows the national Air Quality Index observed on July 25th, the day prior to this exceedance episode. As shown in the figure, some isolated locations of moderate air quality were observed over the Great Lakes, Ohio River Valley, and New York City regions. Back trajectories for July 25th suggest that localized transport of previously polluted air, the slow recirculation around the New York City metropolitan area, the presence of Canadian wildfire smoke, and favorable weather conditions led to the one 8-hour average ozone exceedance in Leonia, New Jersey.

Figure 2. 48-hour Back Trajectories for July 26, 2019 at 10 meters

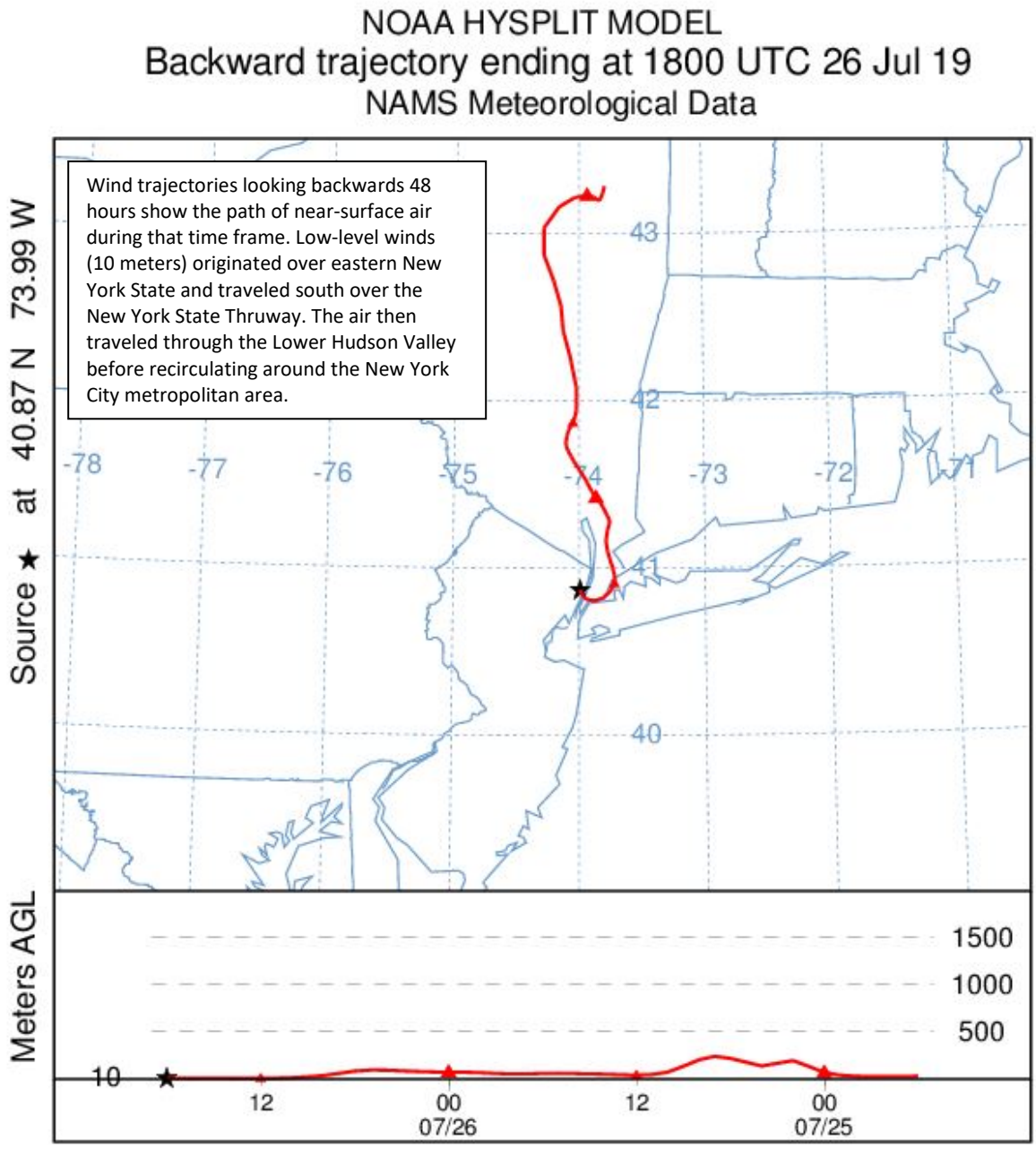


Figure 3. 48-hour Back Trajectories for July 26, 2019 at 500 meters

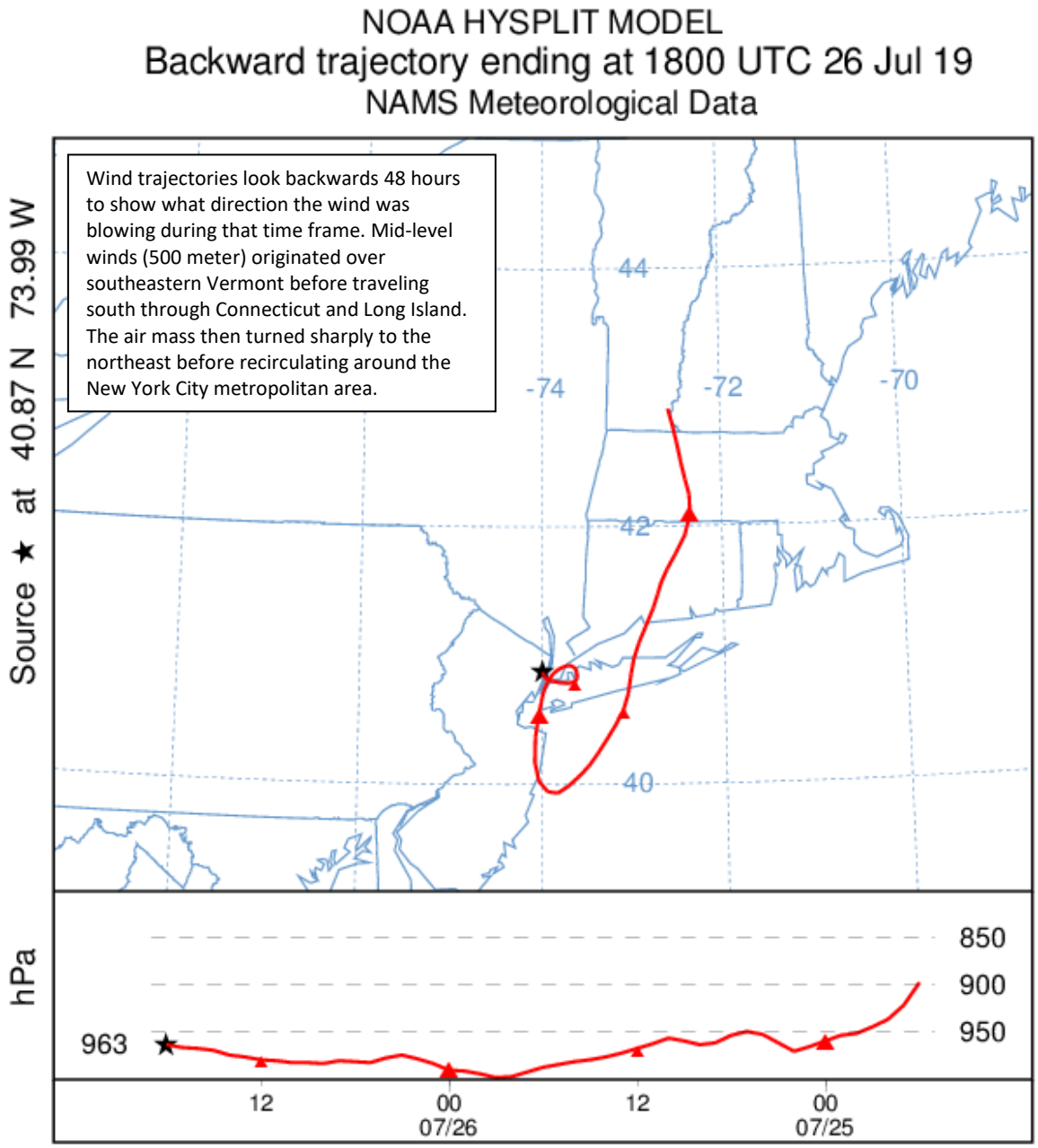


Figure 4. 48-hour Back Trajectories for July 26, 2019 at 1500 meters

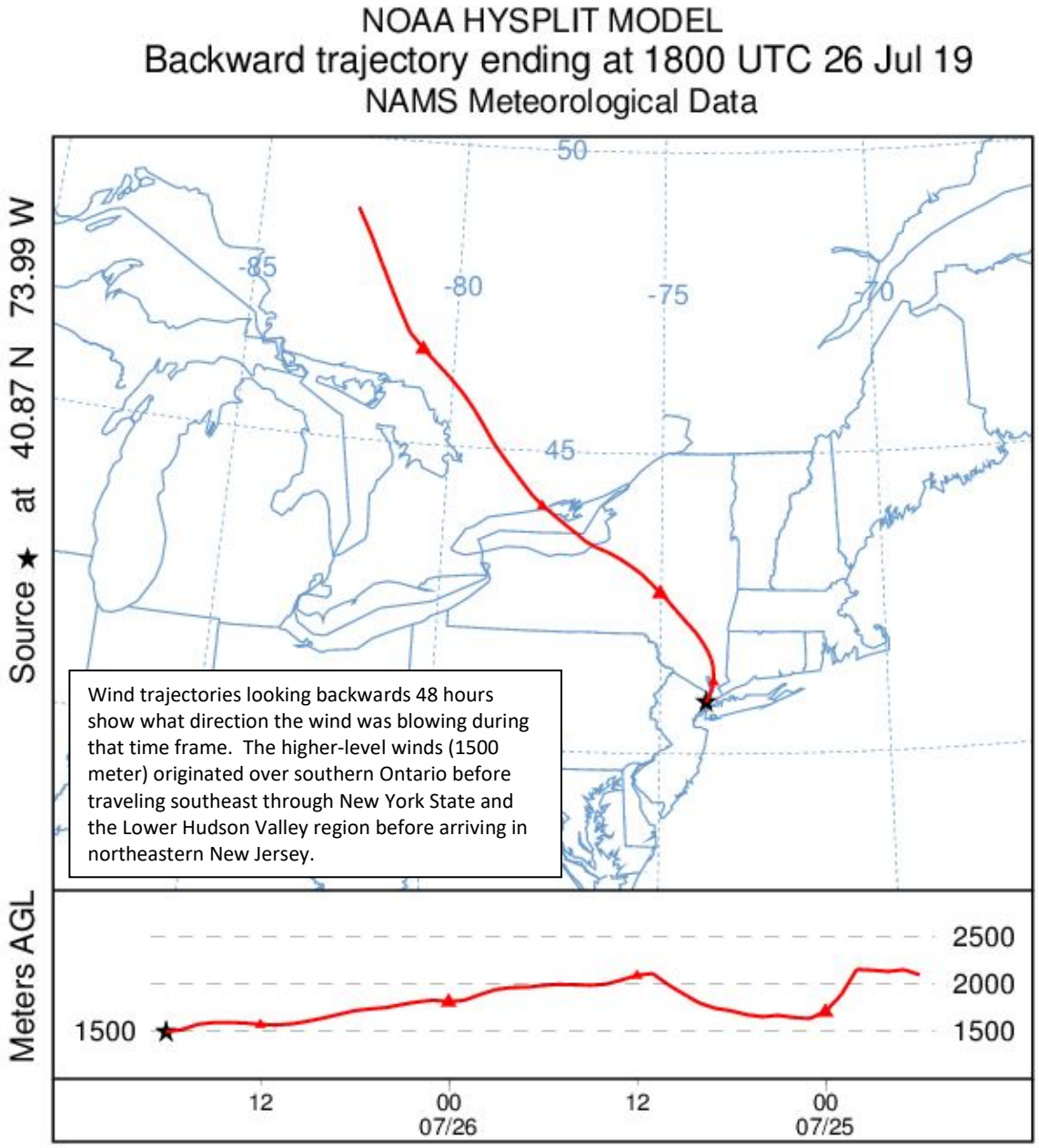
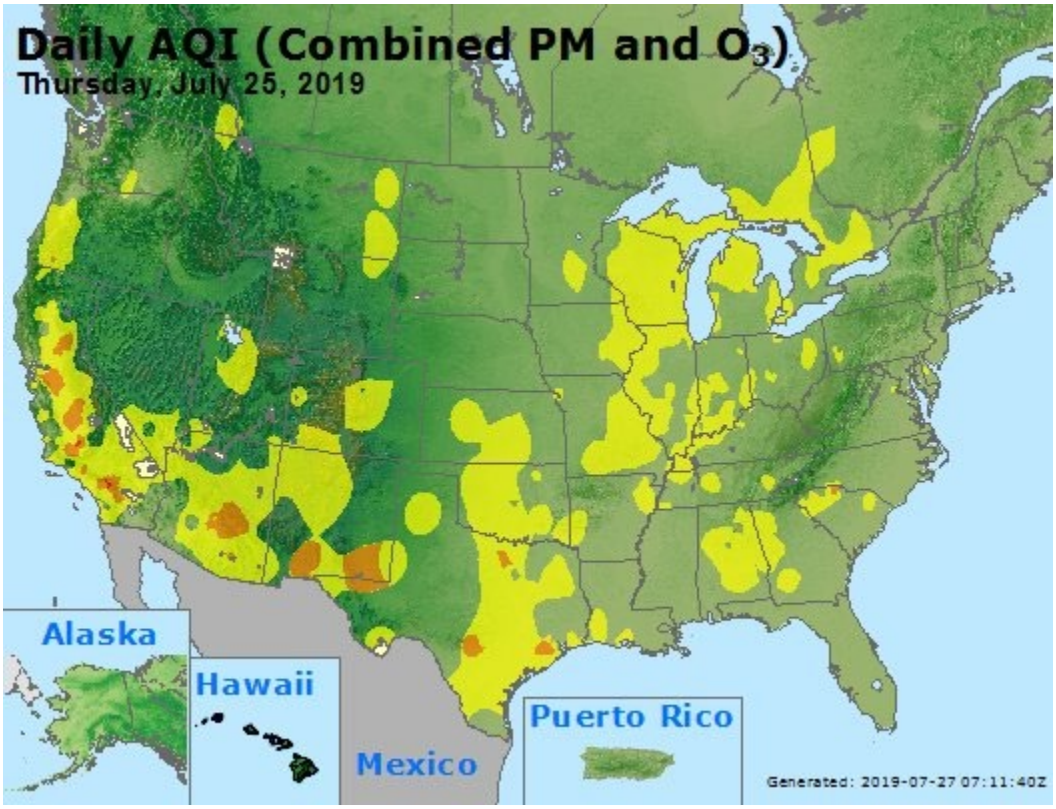


Figure 5. Combined Air Quality Index for the United States on July 25, 2019



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.