Ozone National Ambient Air Quality Standard Health Exceedances on July 28, 2019

Exceedance Locations and Levels

On Sunday, July 28, 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 7/28/2019

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	59
Bayonne	55
Brigantine	45
Camden Spruce St	61
Chester	59
Clarksboro	60
Colliers Mills	63
Columbia	49
Flemington	56
Leonia	61
Millville	57
Monmouth University	62
Newark Firehouse	59
Ramapo	No Data
Rider University	57
Rutgers University	57
Washington Crossing*	No Data
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 six (6) 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 7/28/2019

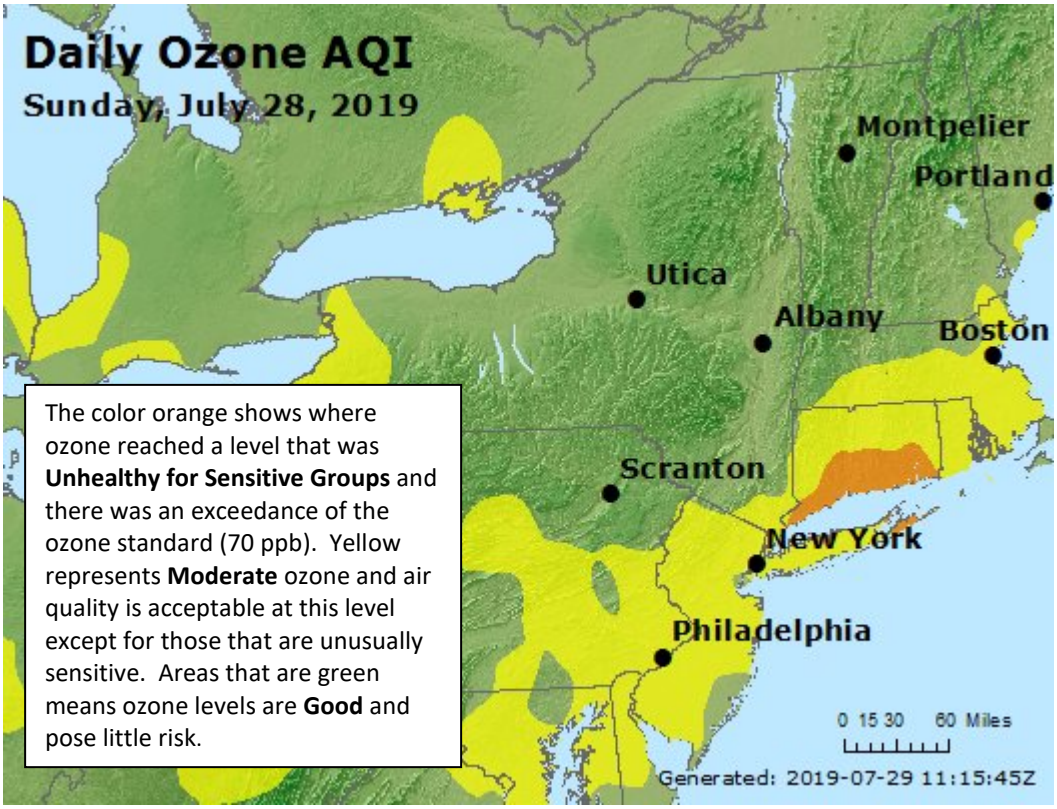
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	61
CT	Greenwich	71
CT	Madison-Beach Road	84
CT	Middletown-CVH-Shed	73
CT	New Haven	81
CT	Stratford	83
CT	Westport	81
DE	BCSP (New Castle Co.)	57
DE	BELLFNT2 (New Castle Co.)	61
DE	KILLENS (Kent Co.)	55
DE	LEWES (Sussex Co.)	46
DE	LUMS 2 (New Castle Co.)	61
DE	MLK (New Castle Co.)	63
DE	SEAFORD (Sussex Co.)	53
MD	Fair Hill	59
NY	Babylon	65
NY	Bronx - IS52	63
NY	CCNY	57
NY	Fresh Kills	53
NY	Holtsville	60
NY	Pfizer Lab	62
NY	Queens	67
NY	Riverhead	66
NY	Rockland Cty	No Data
NY	White Plains	59
PA	BRIS (Bucks Co.)	58
PA	CHES (Delaware Co.)	59
PA	NEWG (Chester Co.)	57
PA	NORR (Montgomery Co.)	58
PA	LAB (Philadelphia Co.)	57
PA	NEA (Philadelphia Co.)	60
PA	NEW (Philadelphia Co.)	61
	TOTAL EXCEEDANCES	6

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 28, 2019 NAAQS = 70 ppb
Connecticut	13
Delaware	3
Maryland	2
New Jersey	10
New York	8
Pennsylvania	6

Figure 1. Ozone Air Quality Index for July 28, 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

High pressure remained in place over the Eastern United States for a third consecutive day resulting in mostly sunny skies, light winds, and warm temperatures. In addition, a surface trough created a mechanism for polluted air aloft to mix down to the surface combining with local emissions generated during the day. Favorable weather conditions in combination with transport from central Pennsylvania and New York City led to multiple exceedances in Connecticut.

A large area of high pressure was anchored over the southeast and spanned much of the eastern United States delivering hot temperatures, mostly sunny skies, and light southwesterly winds throughout the region. This persistent pattern of high pressure is historically favorable for ozone formation and provided multiple days of these conditions exacerbating ozone concentrations at the surface. Meteorological data from Connecticut shows temperatures reached the upper 80s with mostly sunny to clear skies and light winds for the entire day. As the day progressed, a surface trough developed across New Jersey, Long Island and central Connecticut which supported the mixing of polluted air aloft down to the surface. The main reason that exceedances occurred exclusively in Connecticut was because scattered cloud cover developed over New Jersey whereas Connecticut observed fair sky conditions for the entire day.

While much of the nonattainment area saw ozone levels reach moderate and isolated unhealthful for sensitive groups (USG) in the previous days, light southwest winds allowed locally generated emissions from the Pennsylvania and New York City to travel into the northern portion of the nonattainment area. In addition to the above, dilute smoke was noted over the northeastern United States on Sunday, July 28th. This smoke, transported into our region, may have played a role in the elevated concentrations at the surface. The combination of favorable atmospheric conditions, localized transport, and multiple days of high ozone levels all contributed to exceedances in 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 exceedance on July 28, 2019. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Six (6) monitoring stations 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)
CT	Greenwich	71
CT	Madison-Beach Road	84
CT	Middletown-CVH-Shed	73
CT	Stratford	83
CT	New Haven	81
CT	Westport	81

Looking at the back trajectories (Figures 2-4), we can see that air at all levels followed a clockwise circulation around high pressure centered over the Mid-Atlantic in the days leading up to the exceedance episode. The transport of previously polluted air combined with favorable meteorological conditions and caused ozone to exceed the 8-hour average NAAQS throughout the majority of Connecticut.

Air at the surface (Figure 2) originated off of the Mid-Atlantic coast and followed a counter-clockwise rotation from a departing low-pressure system. With high pressure in place over much of the Eastern United States, light southwesterly winds caused a sharp turn towards the northeast, resulting in uniformed transport along the I-95 corridor. This surface level air then traveled over the New York City metropolitan area as well as portions of Long Island before arriving in Connecticut, picking up emissions from cars, trucks, local industry, and peak demand electric generating units (EGUs) along the way.

Air at mid-levels (Figure 3) originated throughout various regions of Virginia and West Virginia, which were polluted for multiple days prior to the exceedance event. The air masses at this level were heavily influenced by the dominating high pressure over the Mid-Atlantic and resulted in a clockwise flow in transport through much of West Virginia and northern Virginia. The different air masses were then transported over western Maryland, Pennsylvania, and the New York City metropolitan area before arriving at the exceedance locations. These air masses passed over industrialized cities such as Richmond, Harrisburg, Allentown, and New York City, picking up additional emissions from cars, trucks, local industry, and peak demand electric generating units (EGUs) along the way.

Air at upper levels (Figure 4) originated over southern Kentucky and West Virginia before following a predominantly northeasterly flow around high pressure centered over the Mid-Atlantic. The air mass traveled northeast with a gradual sinking motion over the Ohio River Valley, Pennsylvania, and the New York City metropolitan area before arriving in Connecticut.

Figure 5 shows the national Air Quality Index observed on July 27th, the day prior to this exceedance episode. As shown in the figure, widespread locations of moderate air quality were observed throughout the Mid-Atlantic and New York City metropolitan area, with a few isolated areas reaching the unhealthy for sensitive groups (USG) category. Back trajectories for July 28th suggest that previously polluted air was transported into the Connecticut region at all levels of the atmosphere. This localized transport of industrial emissions, favorable meteorological conditions, and deteriorated air quality from days prior led to widespread exceedances well into the USG category for the majority of Connecticut.

Figure 2. 48-hour Back Trajectories for July 28, 2019 at 10 meters

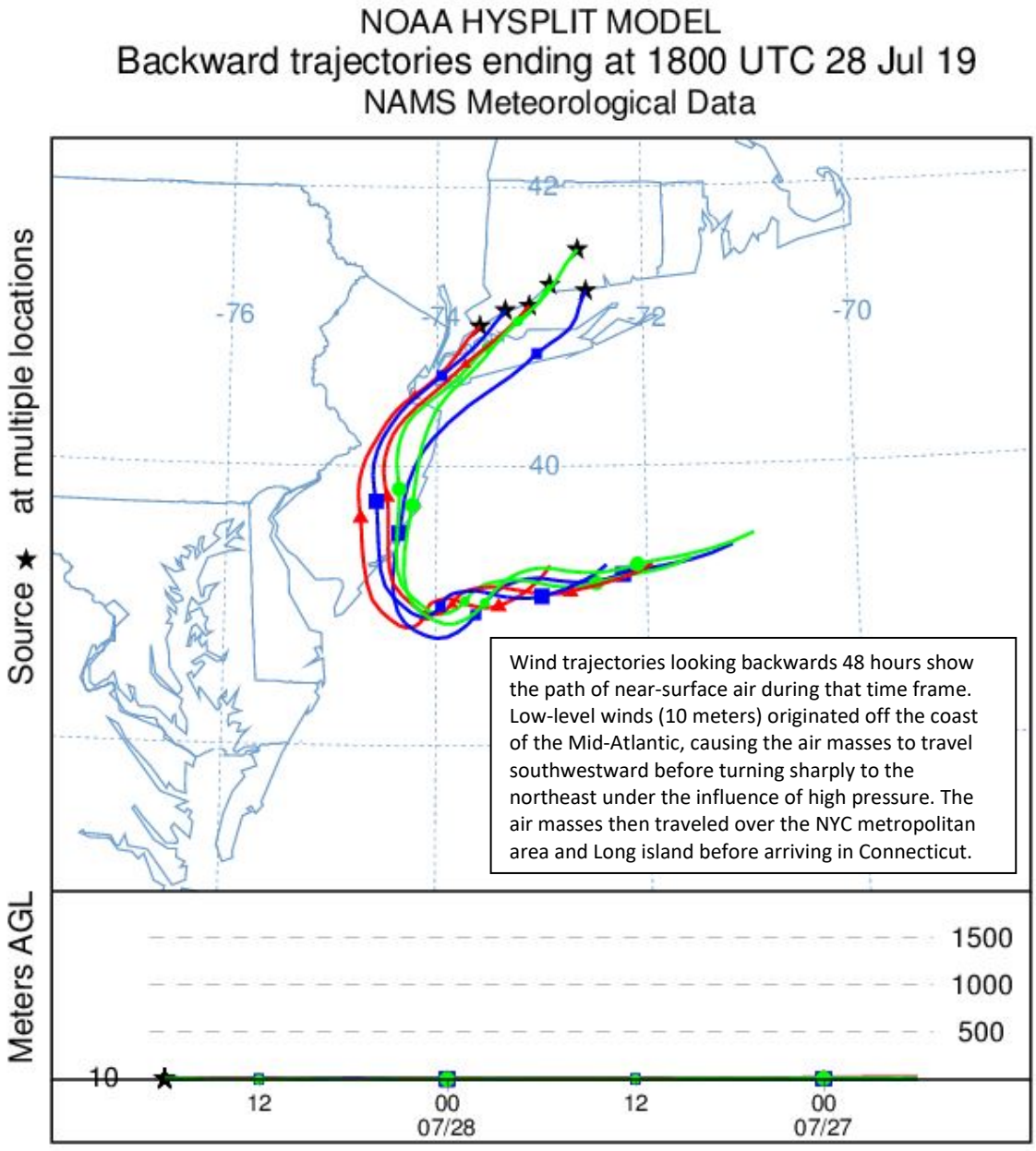


Figure 3. 48-hour Back Trajectories for July 28, 2019 at 500 meters

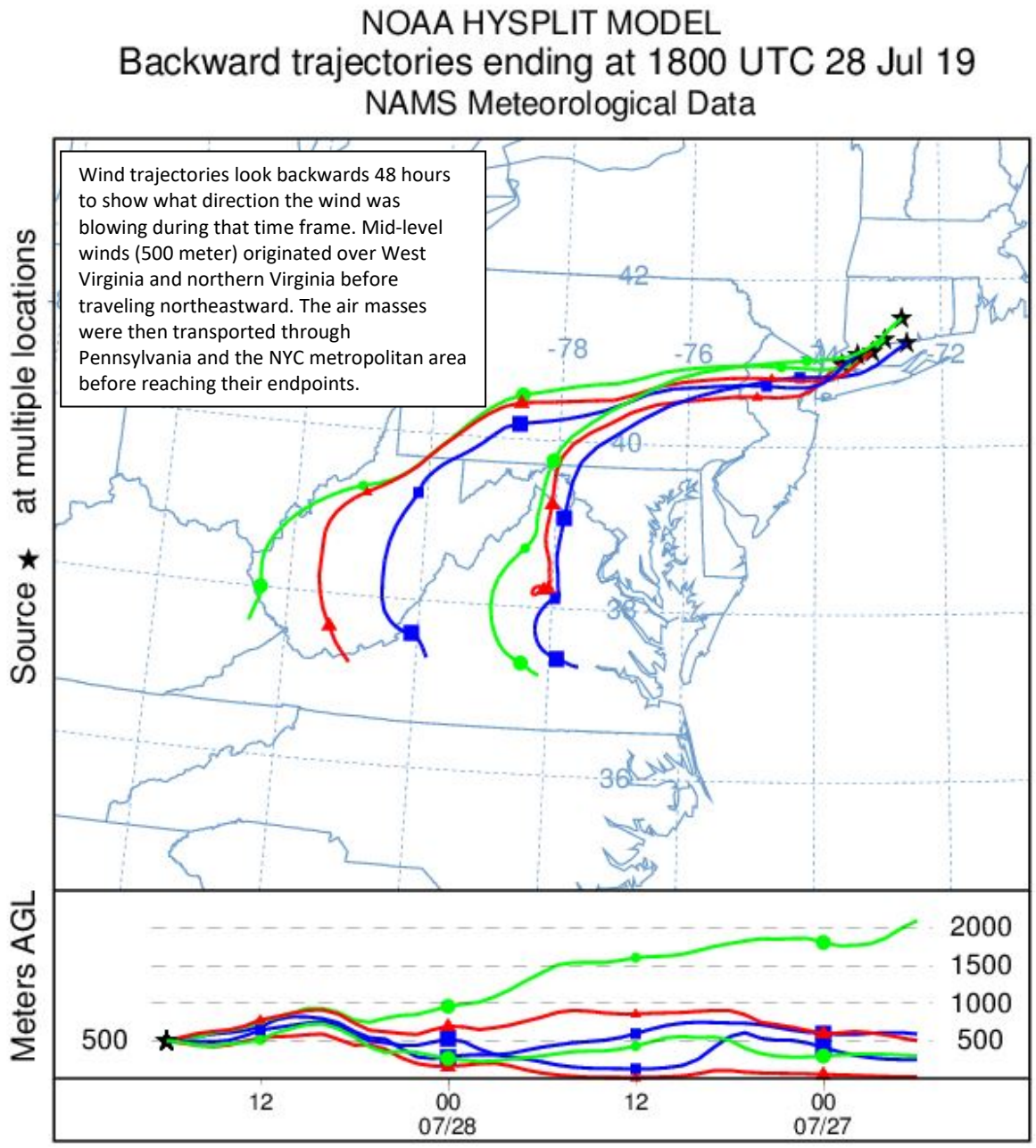


Figure 4. 48-hour Back Trajectories for July 28, 2019 at 1500 meters

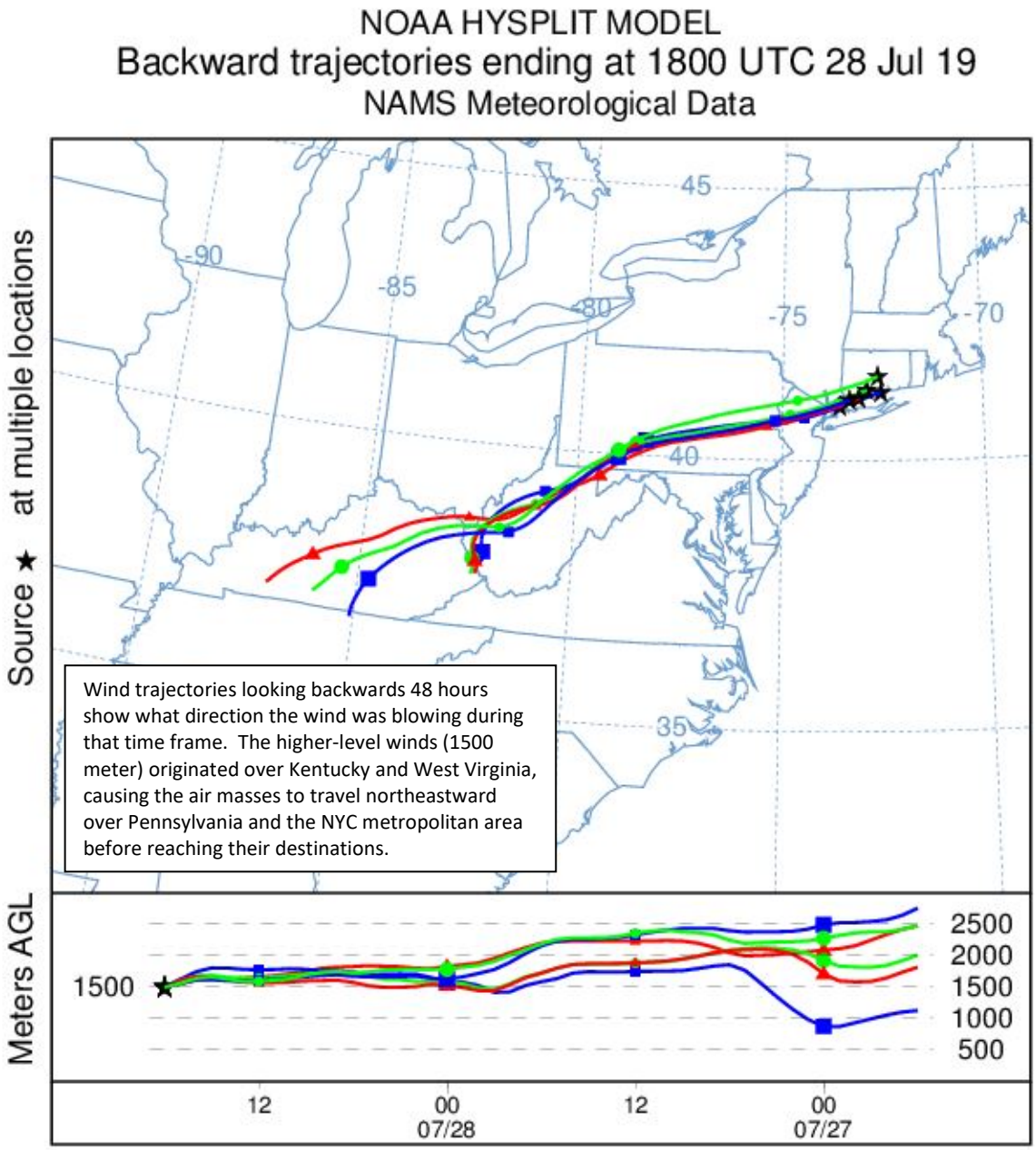
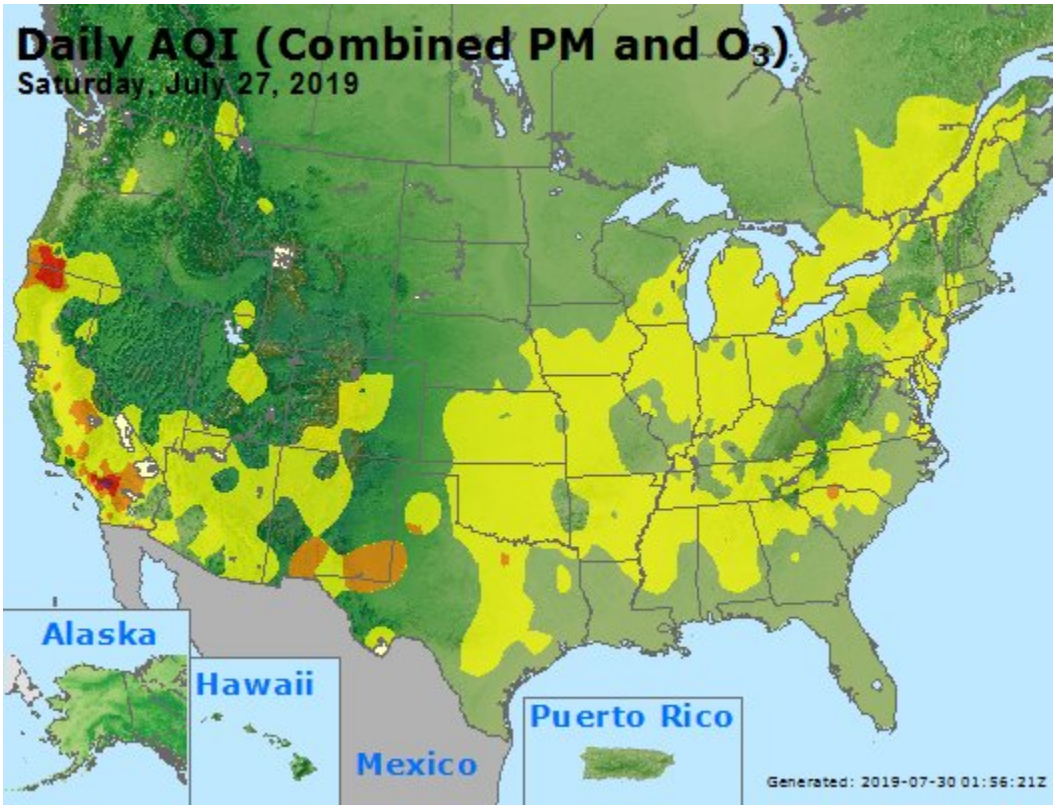


Figure 5. Combined Air Quality Index for the United States on July 27, 2019



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.