Ozone National Ambient Air Quality Standard Health Exceedances on July 16, 2019

Exceedance Locations and Levels

On Tuesday, July 16, 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 7/16/2019

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	57
Bayonne	63
Brigantine	51
Camden Spruce St	69
Chester	62
Clarksboro	54
Colliers Mills	60
Columbia	62
Flemington	66
Leonia	70
Millville	58
Monmouth University	58
Newark Firehouse	67
Ramapo	62
Rider University	69
Rutgers University	75
Washington Crossing*	69
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 thirteen (13) 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 7/16/2019

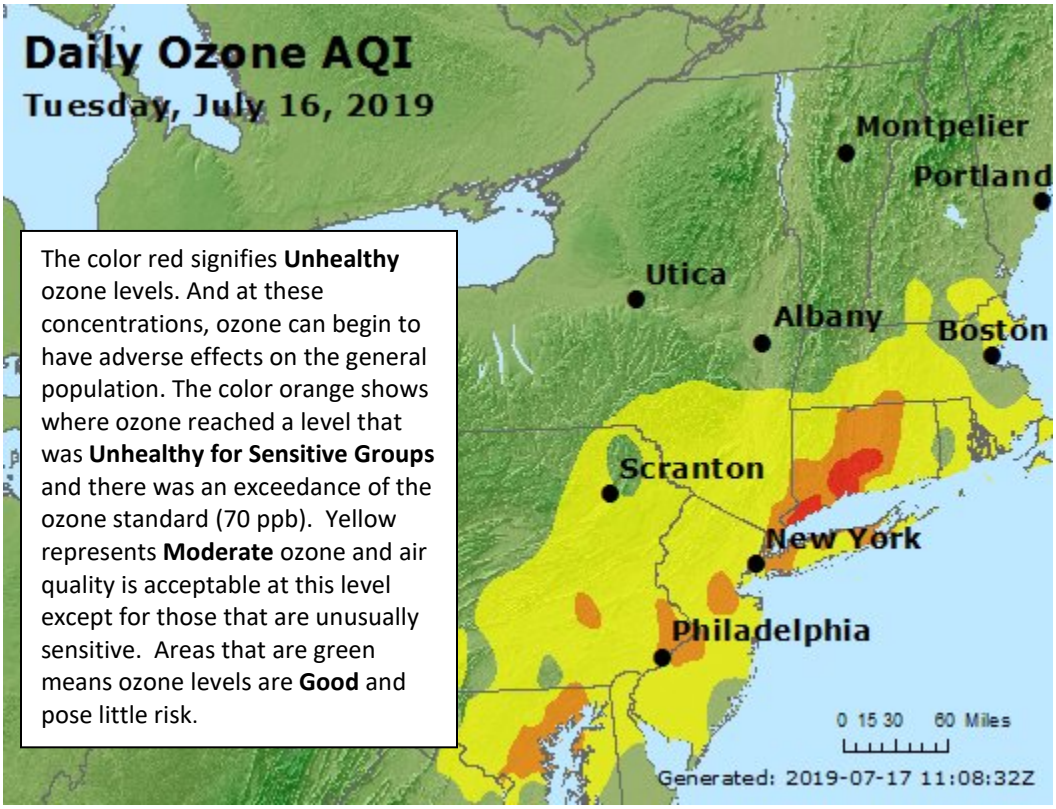
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	75
CT	Greenwich	86
CT	Madison-Beach Road	66
CT	Middletown-CVH-Shed	87
CT	New Haven	89
CT	Stratford	84
CT	Westport	90
DE	BCSP (New Castle Co.)	57
DE	BELLFNT2 (New Castle Co.)	58
DE	KILLENS (Kent Co.)	53
DE	LEWES (Sussex Co.)	47
DE	LUMS 2 (New Castle Co.)	55
DE	MLK (New Castle Co.)	66
DE	SEAFORD (Sussex Co.)	53
MD	Fair Hill	63
NY	Babylon	68
NY	Bronx - IS52	72
NY	CCNY	67
NY	Fresh Kills	69
NY	Holtsville	66
NY	Pfizer Lab	70
NY	Queens	72
NY	Riverhead	71
NY	Rockland Cty	66
NY	White Plains	70
PA	BRIS (Bucks Co.)	81
PA	CHES (Delaware Co.)	59
PA	NEWG (Chester Co.)	63
PA	NORR (Montgomery Co.)	61
PA	LAB (Philadelphia Co.)	76
PA	NEA (Philadelphia Co.)	82
PA	NEW (Philadelphia Co.)	76
	TOTAL EXCEEDANCES	13

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 16, 2019 NAAQS = 70 ppb
Connecticut	8
Delaware	3
Maryland	2
New Jersey	8
New York	7
Pennsylvania	4

Figure 1. Ozone Air Quality Index for July 16, 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 Tuesday, July 16, 2019, multiple high pressure centers were in place across the eastern half of the United States bringing hot temperatures, light southwesterly winds, and sunny skies to the region. This resulted in in multiple ozone exceedances throughout southeastern Pennsylvania, New Brunswick, New York City and Long Island, New York, and Connecticut.

Early on Tuesday, high pressure in our region was centered over southern New York State and over the southern Appalachian Mountains. This broad area of high pressure brought clear, sunny skies to the region, allowing for temperatures to climb into the upper 80's and low 90's across the northeast and into southern New England. A warm front extending off of low pressure centered over northern Ontario draped southward, extending over western New York State, Pennsylvania, and the Mid Atlantic. This frontal boundary extended between the two centers of high pressure, causing it to stall throughout the morning which allowed for enhanced mixing of polluted upper-level air to the surface. As the high-pressure center in the northeast moved offshore, light and variable winds began to shift out of the southwest. The warm front lacked precipitation, but allowed for temperatures and dewpoints to climb to an uncomfortable level. By mid-afternoon, the front had traveled over the majority of New York State, New Jersey, and the Mid-Atlantic states. However, the front began to slow down as it entered Connecticut and eastern Long Island, allowing for prolonged mixing of polluted air from the I-95 corridor to the surface ahead of the front in these locations. This additional mixing allowed for ground level ozone concentrations to climb as high as 90 ppb in Westport, CT. The front's rapid movement through New Jersey along with an enhanced sea-breeze front prevented ozone from reaching the unhealthy for sensitive groups category for most of the Garden State.

The southwesterly winds, hot temperatures, sunny skies and mixing ahead of the warm front allowed for enhanced ground-level ozone production, causing several locations in our non-attainment area to reach the unhealthy for sensitive groups and unhealthy categories.

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 July 16, 2019. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Ten (10) monitoring stations with 8-hour average ozone exceedances 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 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	Rutgers University	75
CT	Greenwich	86
CT	New Haven	89
CT	Westport	90
NY	Bronx	72

NY	Queens	72
NY	Riverhead	71
PA	Bristol	81
PA	NEA	82
PA	NEW	76

Back trajectories on July 16th show transport from portions of upstate New York, Pennsylvania, and several metropolitan centers surrounding New Jersey. Several days of favorable weather conditions for ozone formation mentioned above, in combination with localized transport along the I-95 corridor led to multiple exceedances in our nonattainment area on this day.

Surface and mid-level back trajectories (Figures 2 & 3) followed similar transport pathways. Air traveling to southern portions of the nonattainment area originated in Canada and upstate New York and traveled southeastward through Lake Ontario and New York. Air at the surface then traveled through portions of eastern Pennsylvania including the cities of Scranton and Lancaster before passing through the metropolitan centers of Wilmington, Baltimore, and Philadelphia. During transit, air passed through locations of Pennsylvania where local pollution sources such as EGUs may have been operating. Air at the surface impacting northern New Jersey, New York, and coastal Connecticut followed a similar pathway before crossing through the New York City metropolitan center. In some cases, air at the surface passed over Long Island and the Sound where peaking units may have been operating on this day. In addition, air traveling at ground level originated at higher levels of the atmosphere and mixed down to lower levels, picking up emissions from cars, trucks, industry and power plants along the way.

Upper level back trajectories (Figure 4) originated over the Great Lakes where moderate air quality was observed several days preceding this high ozone event. Upper level trajectories originated in portions of Michigan and traveled southeastward through Ontario including the city of Toronto. Air at the upper levels then passed through upstate New York and eastern Pennsylvania including Philadelphia before reaching its destination. Meanwhile, trajectories traveling to New York and Connecticut passed through the New York City metropolitan center before reaching their endpoints.

Figure 5 shows the national ozone concentrations observed on July 15th, the day prior to this exceedance episode. As shown in the figure, levels of moderate ozone were observed over the Great Lakes which was transported into our region the following day. In addition, the transport of ozone precursors from upwind states contributed to elevated ozone concentrations. Back trajectories for July 16th suggest that localized transport and influence from industrial locations further west, including EGUs, combined with favorable weather conditions led to widespread exceedances throughout our nonattainment area.

Figure 2. 48-hour Back Trajectories for July 16, 2019 at 10 meters

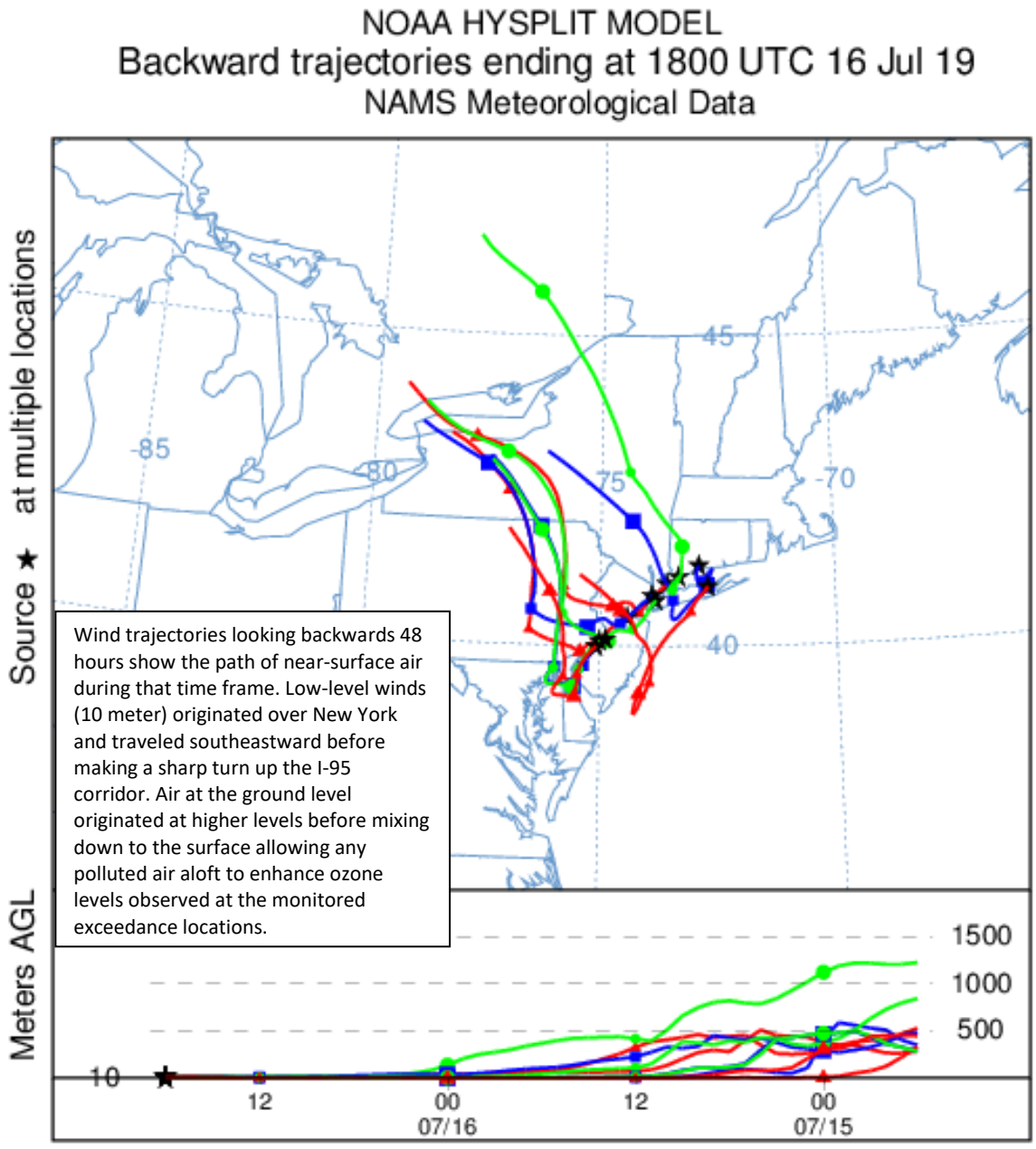


Figure 3. 48-hour Back Trajectories for July 16, 2019 at 500 meters

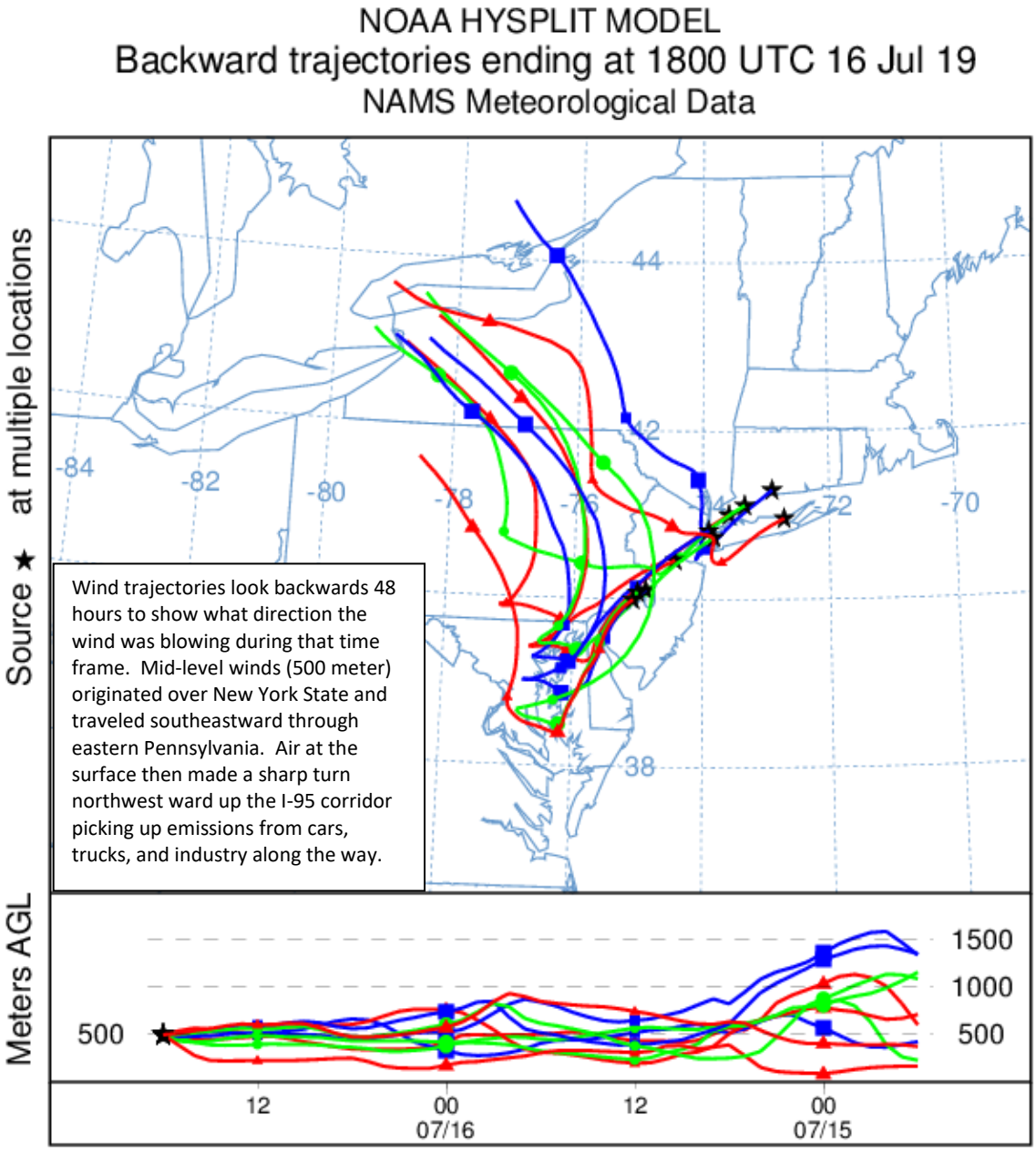


Figure 4. 48-hour Back Trajectories for July 16, 2019 at 1500 meters

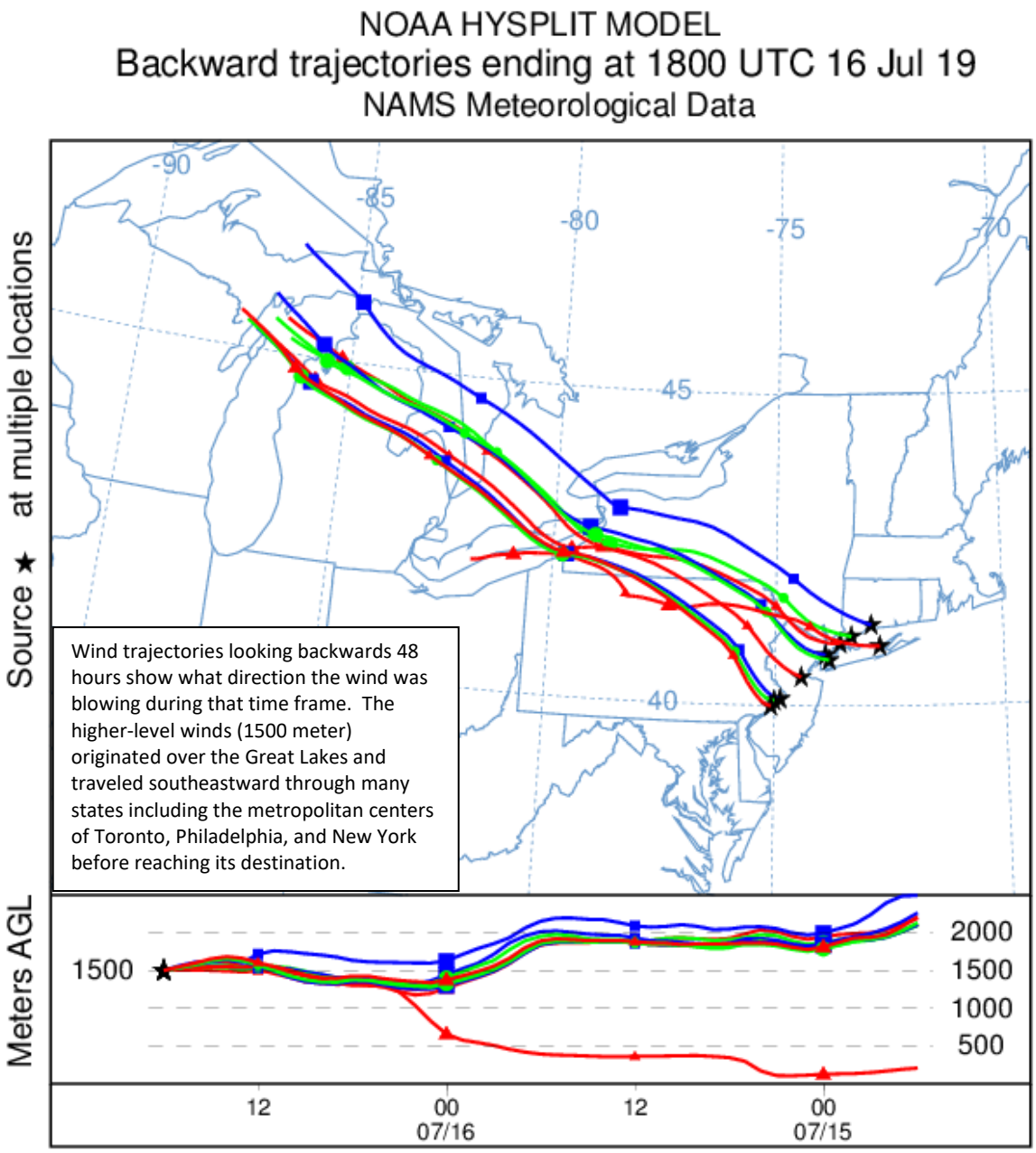
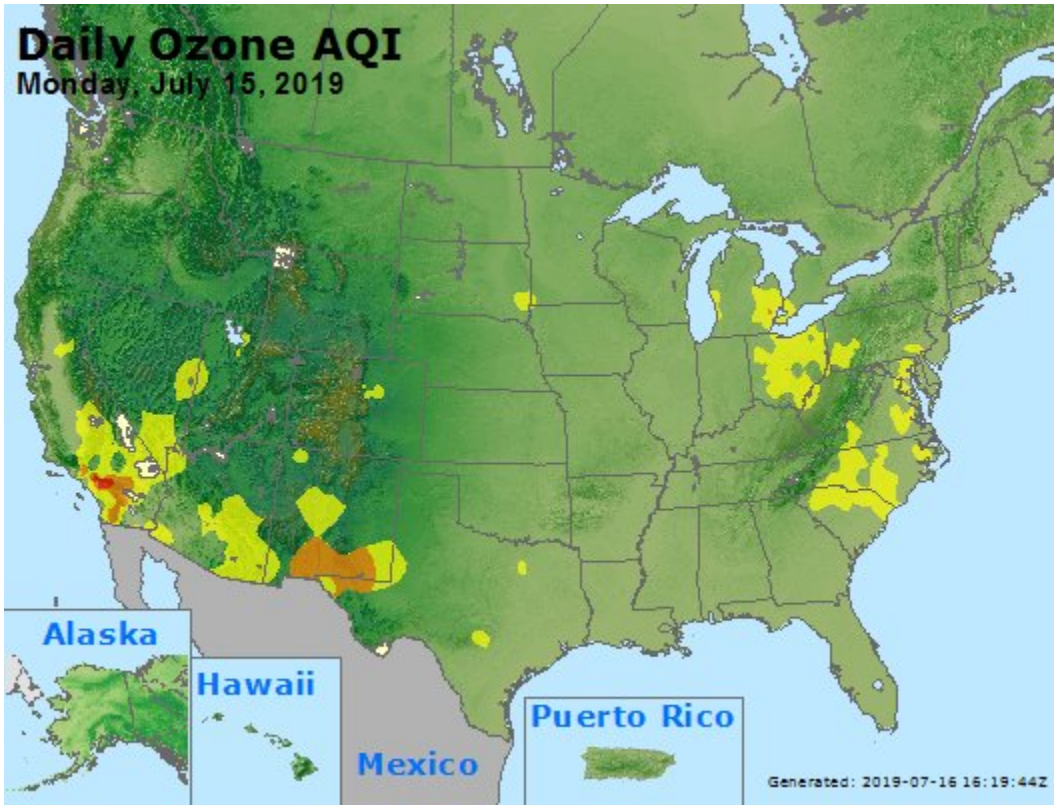


Figure 5. Ozone Air Quality Index for the United States on July 15, 2019



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.