Ozone National Ambient Air Quality Standard Health Exceedances on August 10, 2017

Exceedance Locations and Levels

On Thursday, August 10, 2017, there were no exceedances in New Jersey of the 8-hour average ozone National Ambient Air Quality Standard (NAAQS) of 70 ppb that became effective in December 2015.

No New Jersey station exceeded the 75 ppb ozone NAAQS of 2008, and none exceeded the 84 ppb ozone NAAQS of 1997. The highest 1-hour average ozone concentration recorded on August 10, 2017, in New Jersey was 74 ppb at the Ramapo station, which is below the 1-hour ozone NAAQS of 120 ppb.

The number of days in 2017 on which exceedances of the 70 ppb ozone NAAQS of 2015 were recorded in New Jersey remains at thirteen (13). By the 10th of August in 2016, there were twenty-one (21) days on which ozone exceedances were measured in New Jersey (based on the 70 ppb NAAQS of 2015), and there were ten (10) days by this same date in 2015 (based on the former 75 ppb NAAQS of 2008) (See Table 1):

Table 1: New Jersey Exceedance Count

	# of Days NAAQS was Exceeded January 1 – August 10, 2017 NAAQS = 70 ppb	# of Days NAAQS was Exceeded January 1 – August 10, 2016 NAAQS = 70 ppb	# of Days NAAQS was Exceeded January 1 – August 10, 2015 NAAQS = 75 ppb
New Jersey	13	21	10

There is a group of monitoring stations in designated counties of 5 states, New York, Connecticut, Pennsylvania, Delaware and Maryland, that are included in New Jersey's ozone nonattainment areas. From this group of stations in the neighboring states, there were two (2) exceedances of the 70 ppb ozone NAAQS of 2015 recorded on Thursday, August 10, 2017 (See Table 2):

Table 2: Ozone NAAQS Exceedances at other Monitoring Stations in New Jersey's Ozone Nonattainment Areas on August 10, 2017

STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Stratford	73
CT	Westport	75

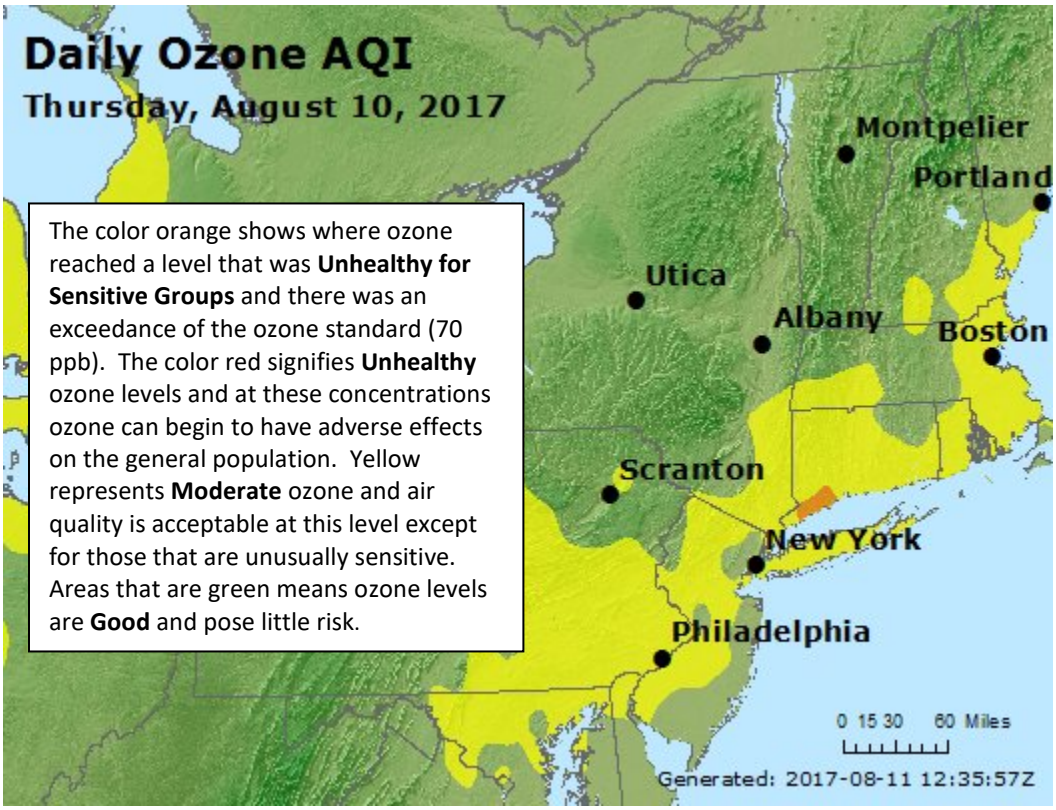
No station exceeded the 75 ppb ozone NAAQS of 2008, and none exceeded the 84 ppb ozone NAAQS of 1997. The highest 1-hour average ozone concentration recorded was 93 ppb at the Stratford and Westport stations in Connecticut, which is below the 1-hour ozone NAAQS of 120 ppb.

Thursday marks the 19th day in 2017 on which exceedances of the 70 ppb ozone NAAQS of 2015 were recorded for Connecticut. The number of days for New York remains at fourteen (14), with twelve (12) for Pennsylvania, and seven (7) days each for Maryland and Delaware (See Table 3). Figure 1 shows graphically the region's ozone concentrations on August 10, 2017.

Table 3: Number of Ozone Exceedances by State

STATE	# of Days NAAQS was Exceeded January 1 – August 10, 2017 NAAQS = 70 ppb
Connecticut	19
Delaware	7
Maryland	7
New Jersey	13
New York	14
Pennsylvania	12

Figure 1: Ozone Air Quality Index for August 10, 2017



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

Weak high pressure remained in effect over the Northeast for several days prior to the exceedances in Connecticut. On August 10th, as the surface high progressed eastward, a frontal boundary to the south gradually lifted northward causing a weak trough to form between the two air masses. This trough acted as a convergence zone where winds at the surface from different directions come together. Although this boundary did not lead to the development of afternoon showers and thunderstorms, it is likely that it contributed to the mixing of locally generated pollution within the boundary layer.

Meteorological data from across the region shows temperatures reached the low 80s by mid-afternoon. During the pre-dawn hours, exceedance locations in Connecticut experienced patchy fog which dissipated shortly after sunrise. Throughout the day, Westport and Stratford experienced clear skies with light/variable winds generally from the south. Southerly winds developed as a result of the previously mentioned frontal boundary moving closer to the coast and causing an on-shore flow at the surface.

The persistent pattern of high pressure in the days prior to the exceedance created favorable conditions for locally generated pollution to gradually accumulate. The surface trough that developed over the exceedance monitors extended into the Atlantic Ocean and may have resulted in the highest exceedance values being exclusive to 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 10, 2017. The figures illustrate where the winds came from during the 48 hours preceding the high ozone event. Two (2) monitoring stations with 8-hr ozone exceedance were used to run back trajectories. The 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	Stratford	73
CT	Westport	75

Surface level back trajectories (Figure 2) show that air at the surface affecting exceedance locations in Connecticut originated in eastern New Jersey. On August 9th, air at the surface traveled eastward into the Atlantic Ocean where it encountered a surface trough that had developed over the ocean during the mid-day hours. This boundary caused the wind to change direction and migrate northward where it later passed over Long Island and The Sound on August 10th picking up emissions from stationary sources (industrial, EGU, and commercial). Winds at the surface remained at the surface for the duration of its path further collecting emissions from cars and trucks in Long Island. Mid-level back trajectories (Figure 3) originated in western New Jersey and recirculated around coastal portions of the state before heading northeastward into Long Island. Winds at the mid-level quickly made a 90 degree turn toward the north with the intersection of a mid-level surface trough on August 10th. Mid-level trajectories originated closer to the surface and slowly rose to an elevation of 500m by the end of its

path. Upper level trajectories (Figure 4) originated at higher altitudes in southeast Ontario and quickly traveled through New York State as it slowly descended to 1500m. Upper level winds then traveled through Connecticut and recirculated around the Long Island Sound before reaching its endpoint. Trajectories at both the mid and upper level remained elevated throughout the duration of their path and therefor did not contribute to the ozone exceedances observed.

Figure 5 below shows graphically the national ozone concentrations on August 9th, 2017, one day prior to the observed ozone exceedances. This map illustrates that ozone levels were generally clean throughout the eastern United States and therefore this event was likely due to locally generated emissions.

Figure 2: 48-hour Back Trajectories for August 10, 2017 at 10 meters

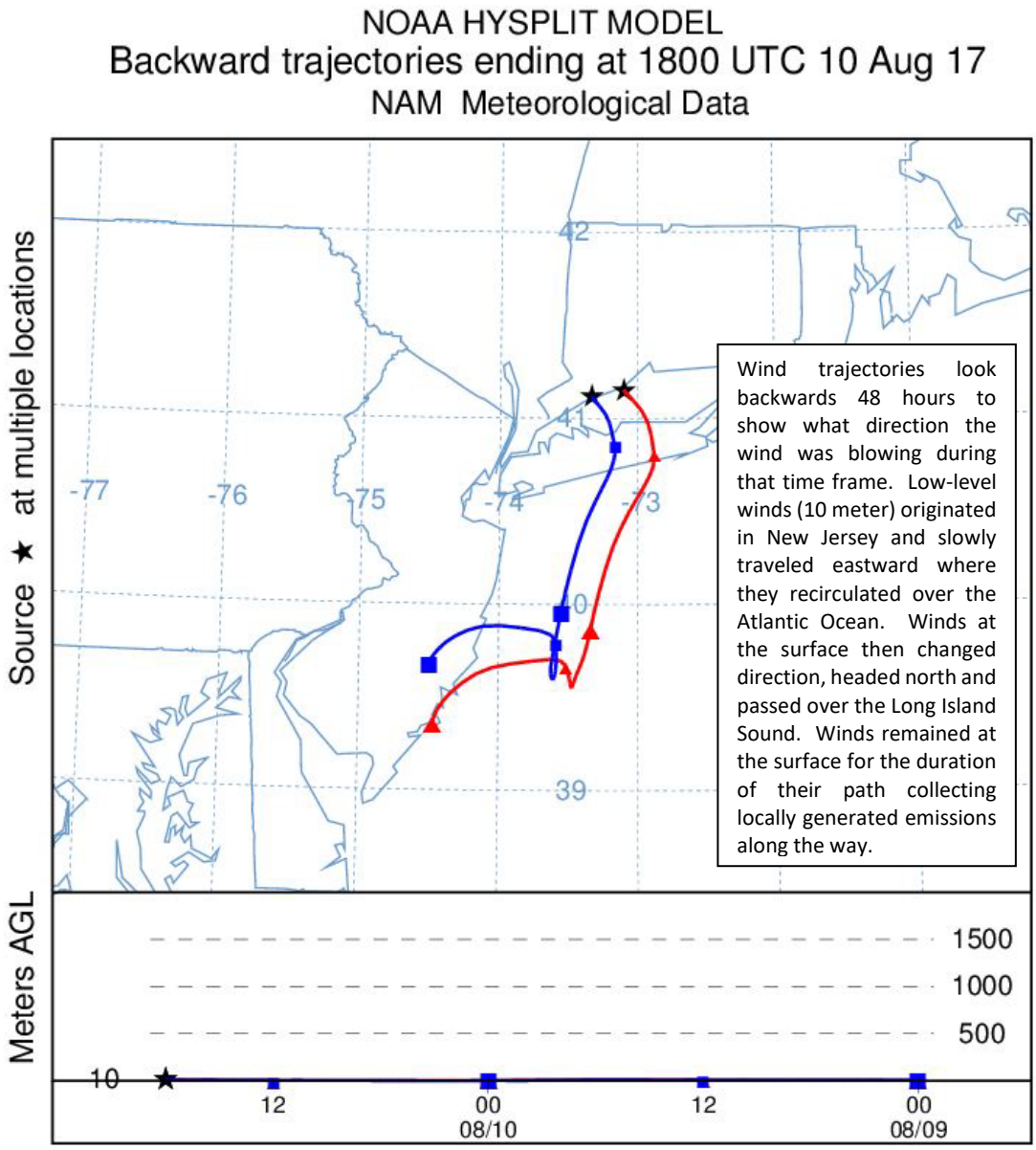


Figure 3: 48-hour Back Trajectories for August 10, 2017 at 500 meters

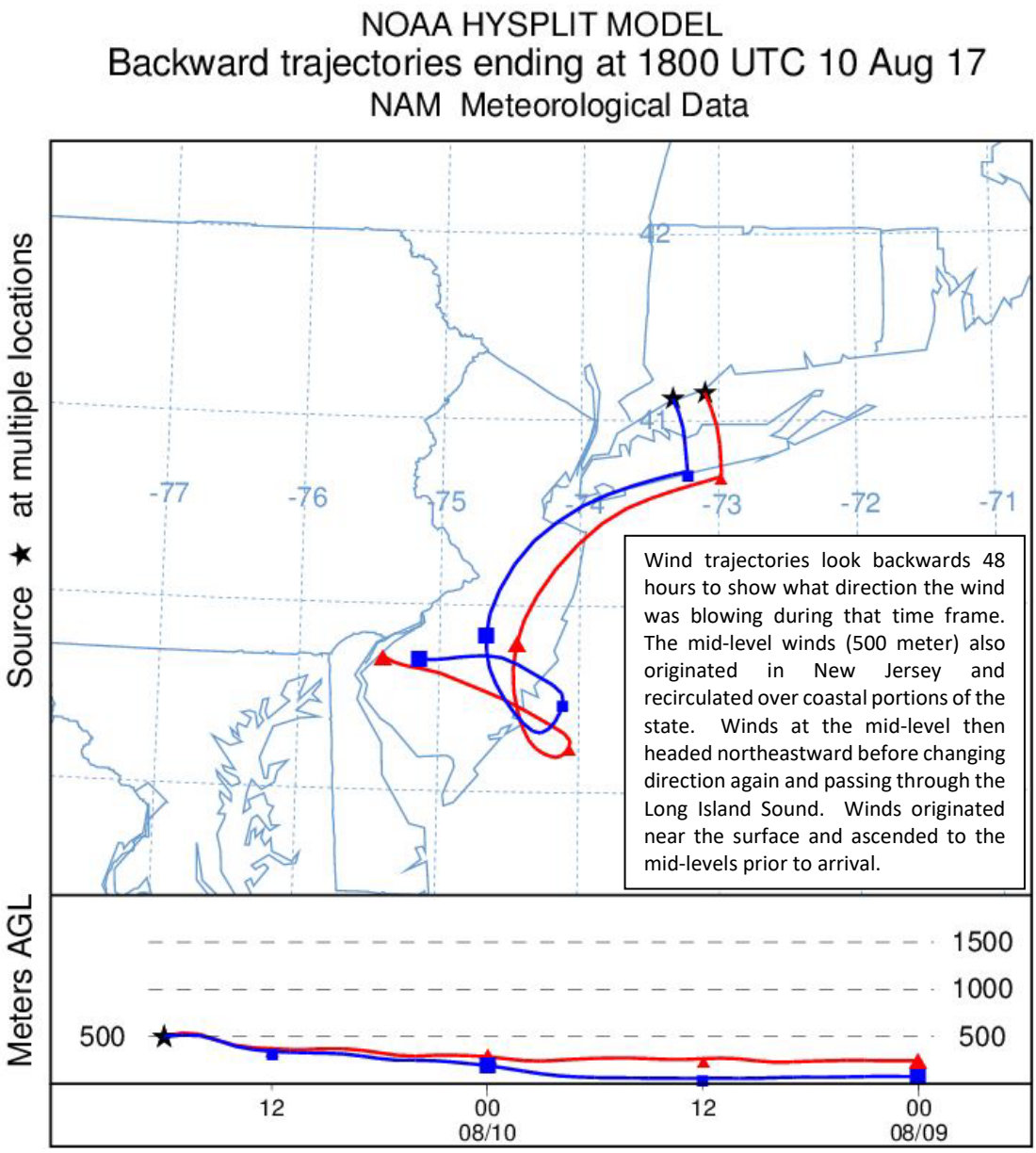


Figure 4: 48-hour Back Trajectories for August 10, 2017 at 1500 meters

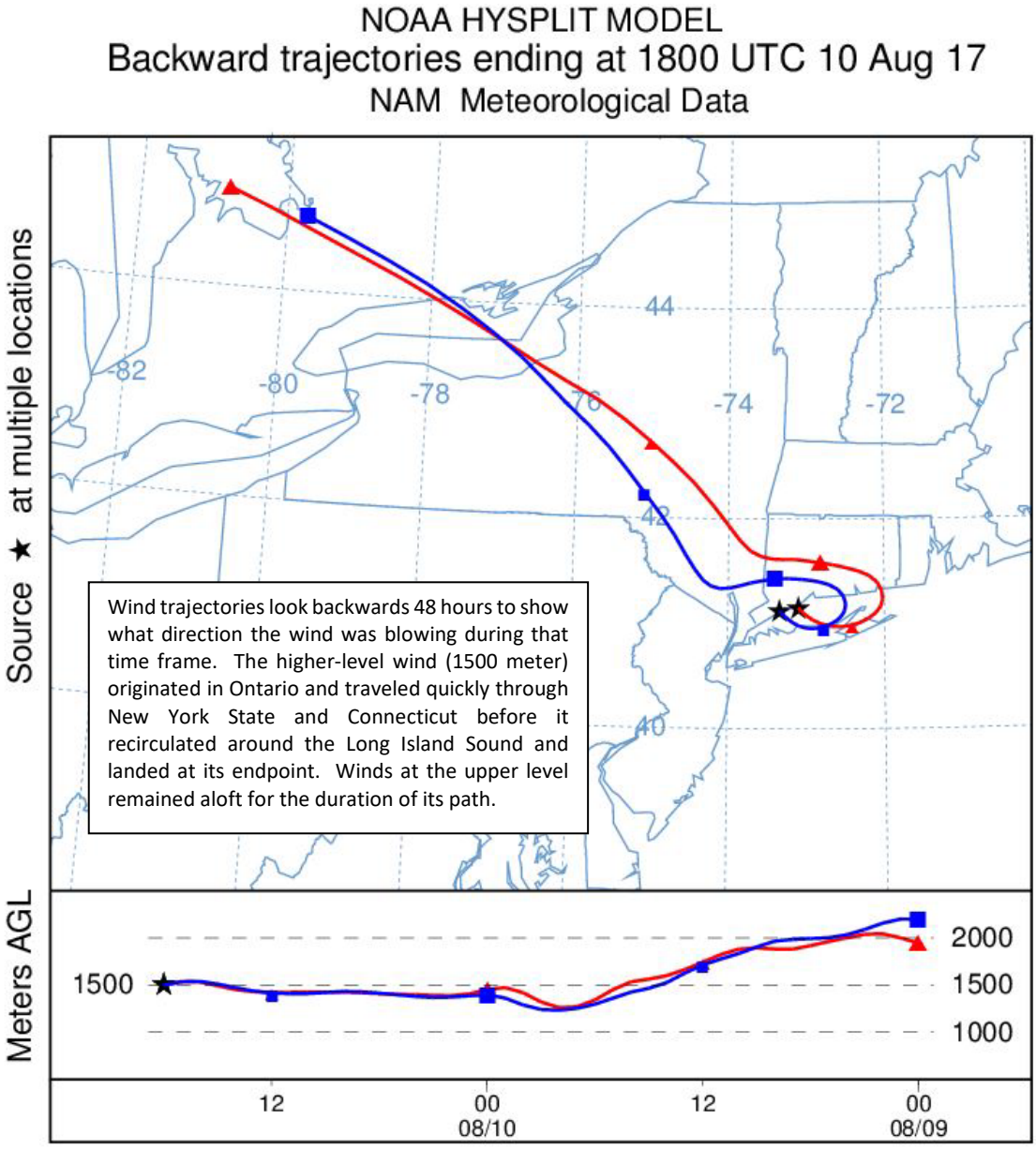
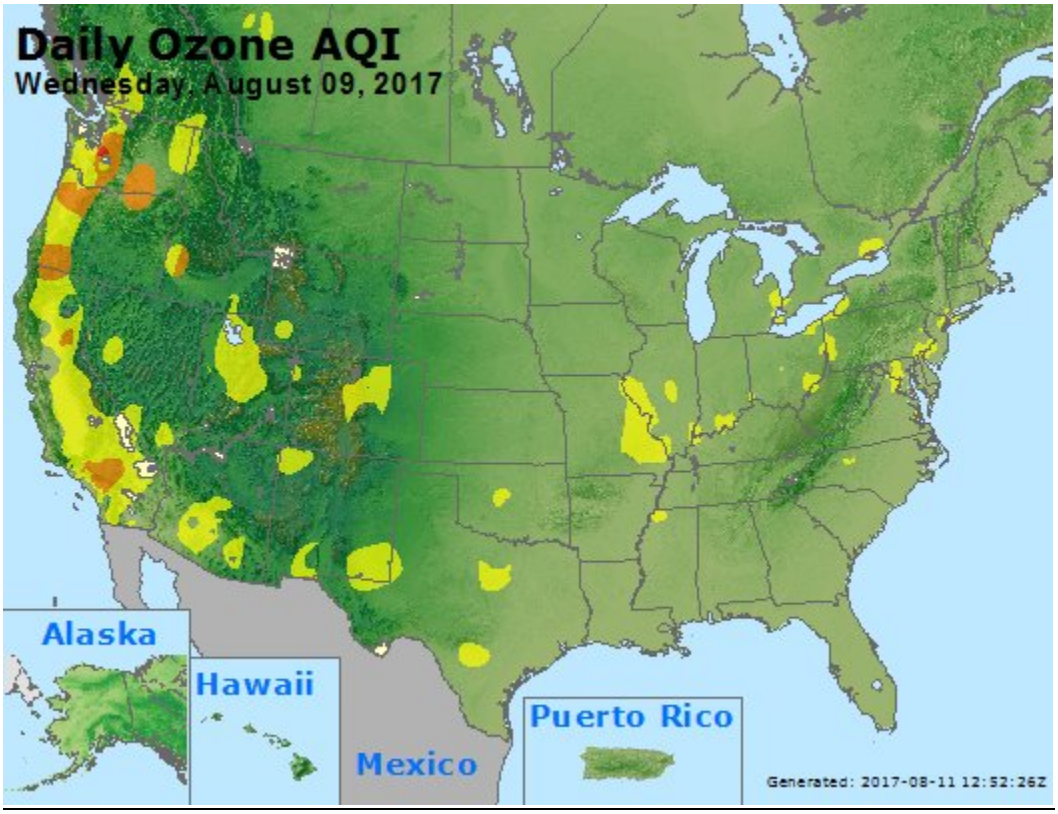


Figure 5: Ozone Air Quality Index for the United States on August 9, 2017



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.