Ozone National Ambient Air Quality Standard Health Exceedances on June 9, 2020

Exceedance Locations and Levels

On Tuesday, June 9, 2020, there were two (2) 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 6/9/2020

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	57
Bayonne	62
Brigantine	58
Camden Spruce St	59
Chester	65
Clarksboro	64
Colliers Mills	59
Columbia	67
Flemington	63
Leonia	64
Millville	56
Monmouth University	60
Newark Firehouse	65
Ramapo	60
Rider University	74
Rutgers University	74
Washington Crossing*	65
TOTAL EXCEEDANCES	2

*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 nine (9) 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 6/9/2020

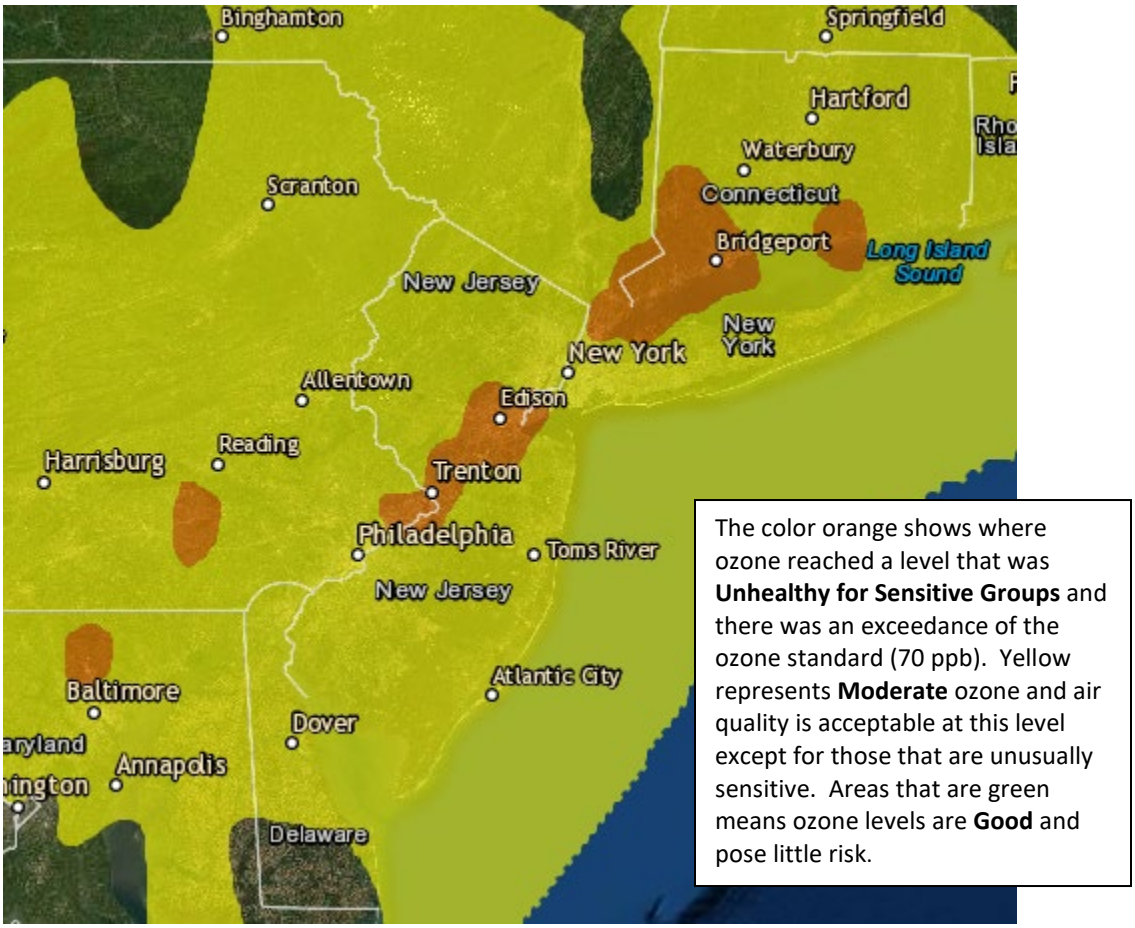
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	71
CT	Greenwich	83
CT	Madison-Beach Road	71
CT	Middletown-CVH-Shed	68
CT	New Haven	60
CT	Stratford	82
CT	Westport	73
DE	BCSP (New Castle Co.)	57
DE	BELLFNT2 (New Castle Co.)	58
DE	KILLENS (Kent Co.)	58
DE	LEWES (Sussex Co.)	54
DE	LUMS 2 (New Castle Co.)	57
DE	MLK (New Castle Co.)	61
DE	SEAFORD (Sussex Co.)	52
MD	Fair Hill	62
NY	Babylon	61
NY	Bronx - IS52	69
NY	CCNY	69
NY	Fresh Kills	71
NY	Holtsville	59
NY	Pfizer Lab	73
NY	Queens	68
NY	Riverhead	61
NY	Rockland Cty	57
NY	White Plains	70
PA	BRIS (Bucks Co.)	71
PA	CHES (Delaware Co.)	61
PA	NEWG (Chester Co.)	63
PA	NORR (Montgomery Co.)	60
PA	LAB (Philadelphia Co.)	64
PA	NEA (Philadelphia Co.)	71
PA	NEW (Philadelphia Co.)	67
	TOTAL EXCEEDANCES	9

The number of days in 2020 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 2020

STATE	# of Days NAAQS was Exceeded January 1 – June 9, 2020 NAAQS = 70 ppb
Connecticut	2
Delaware	0
Maryland	0
New Jersey	1
New York	1
Pennsylvania	1

Figure 1. Ozone Air Quality Index for June 9, 2020



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 off the Mid-Atlantic coast dominated the weather pattern on Tuesday June 9, 2020, while multiple frontal boundaries were observed in the vicinity. Abundant sunshine, warm temperatures, and winds tending from the southwesterly direction allowed for unhealthy for sensitive groups (USG) ozone levels along portions of the I-95 corridor, stretching from the Philadelphia Metropolitan area, northeast toward the Connecticut coastline.

High pressure lingered off the Mid-Atlantic coast on June 9th leading to favorable weather conditions for ozone formation throughout the non-attainment area. Sunny skies and temperatures reaching the mid-upper 80's was observed while southwesterly winds allowed for localized transport along the I-95 corridor. Additionally, the non-attainment area was influenced by two frontal boundaries on this day. A stationary front was draped to the north over portions of New York and New England and moved little throughout the day. Meanwhile, a second frontal boundary, associated with the remnants of tropical storm Cristobal raced northward throughout the day, stalling over the Mid-Atlantic region in the late afternoon/evening hours. This atmospheric setup allowed for the long-range transport of polluted air from the Great Lakes/ Mid-West regions which impacted the non-attainment area. Under the influence of sinking motion associated with high pressure, this polluted air was brought down to the surface, enhancing an already increasingly polluted atmosphere.

The widespread exceedances noted in our non-attainment area on June 9th can be attributed to favorable weather conditions for ozone formation as well as a combination of localized transport along the I-95 corridor and long-range transport from the Great Lakes/ Mid-West regions.

Where Did the Air Pollution that Caused Ozone Come From?

Please note, these exceedances are occurring while COVID-19 restrictions in New Jersey are in place, which have impacted transportation, business operations and energy use. As more data becomes available, the Department may have a better characterization of the conditions that influenced elevated ozone pollution levels in 2020.

Figures 2, 3, and 4 show the back trajectories starting at different wind heights for the monitored exceedances on June 9th, 2020. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedance. Ten monitoring stations were chosen to run back trajectories and are listed in Table 4 below.

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

STATE	STATION	Daily Maximum 8-Hr Average (ppb)

CT	Danbury	71
CT	Greenwich	83
CT	Madison-Beach Road	71
CT	Stratford	82
CT	Westport	73
NJ	Rider University	74
NJ	Rutgers University	74
NY	Pfizer Lab	73
PA	Bristol	71
PA	NEA	71

The back trajectories from June 9th show that the transport of air at the surface and mid-levels were heavily influenced by high pressure, resulting in a stagnant air mass travelling up the I-95 corridor. This in combination with previously polluted air from the Mid-West and Great Lakes region allowed ozone concentrations to reach unhealthy for sensitive groups category in multiple locations throughout the non-attainment zone.

Figure 2 shows that the majority of the surface-level air entered the region from southern Ontario and over Lake Superior. Under the influence of high-pressure circulation, trajectories started in the upper level of the atmosphere and gradually mixed down to the surface along its path. At the surface trajectories traveled in a southeasterly direction, through portions of central New York, and eastern Pennsylvania, picking up localized emissions from cars, trucks, and industry. As high pressure moved off the coast, winds shifted out of the southwest, allowing trajectories to move in a northeasterly direction along the I-95 corridor. Before reaching their end points, trajectories passed through the metropolitan areas of Baltimore, Philadelphia, and New York City. Figure 3 depicts the mid-level trajectories at 500 meters. Trajectories at this level followed a similar transport pathway to the surface trajectories. At the mid-levels, air also originated at higher levels of the atmosphere, and mixed down to 500 meters due to high pressure influence off the Mid-Atlantic coast. Midway through its path, air stalled in portions of central Pennsylvania, allowing additional pollutants from industry to accumulate.

Upper level trajectories (Figure 4) originated primarily in portions of the Mid-West, and were influenced by strong upper level flow, as it traveled north through the Great Lakes region. The day prior, widespread moderate and isolated areas of unhealthy for sensitive groups ozone was observed in this region, as shown in Figure 5. At the upper levels air traversed through portions of southern Ontario, western New York, and northeast Pennsylvania, before reaching its destination. In conclusion, the HYSPLIT back trajectories suggest that the polluted air in this region was transported into our non-attainment area at upper levels and enhanced localized transport along the I-95 corridor, resulting in continued ground-level ozone production.

Figure 2. 48-hour Back Trajectories for June 9, 2020 at 10 meters

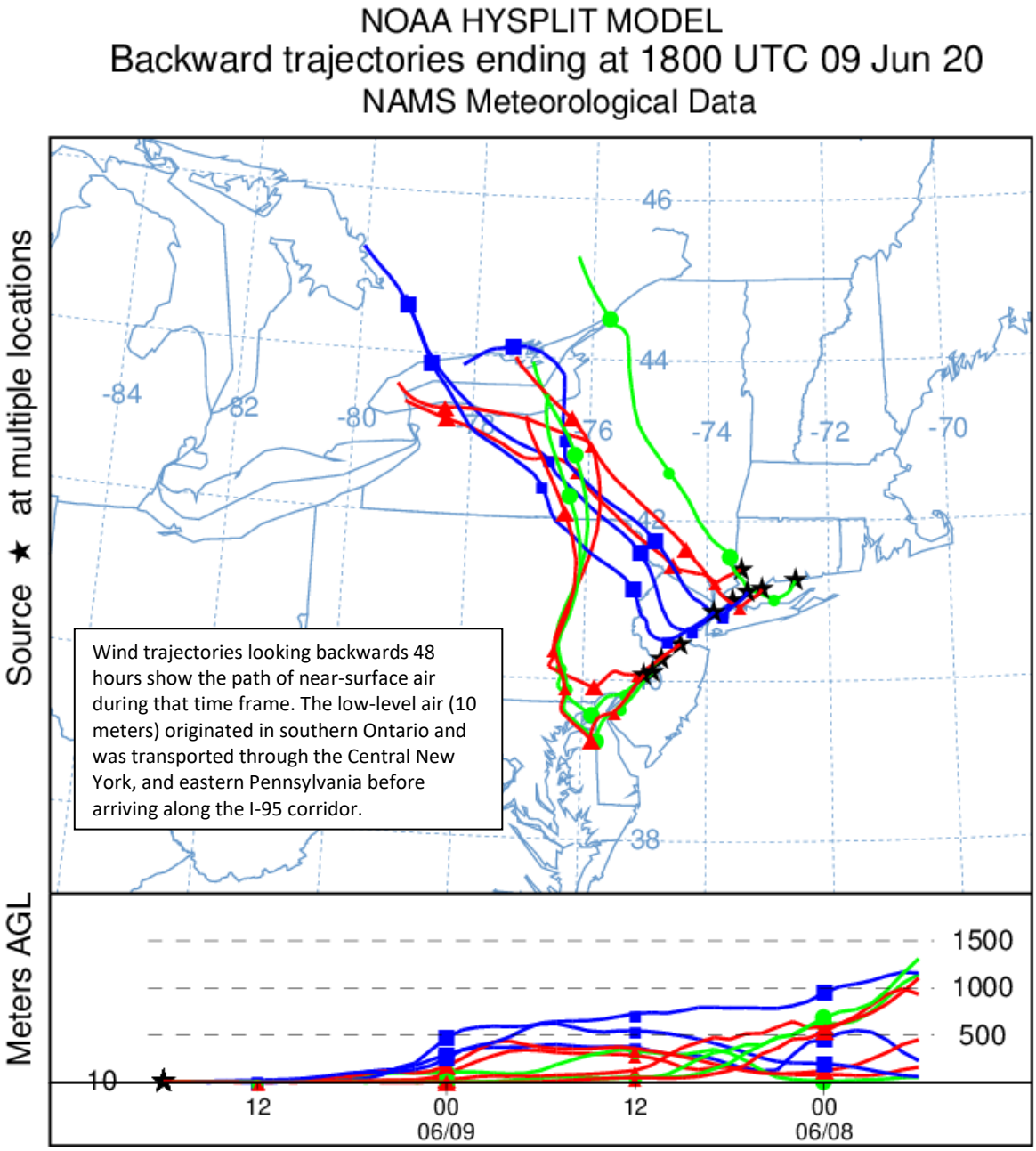


Figure 3. 48-hour Back Trajectories for June 9, 2020 at 500 meters

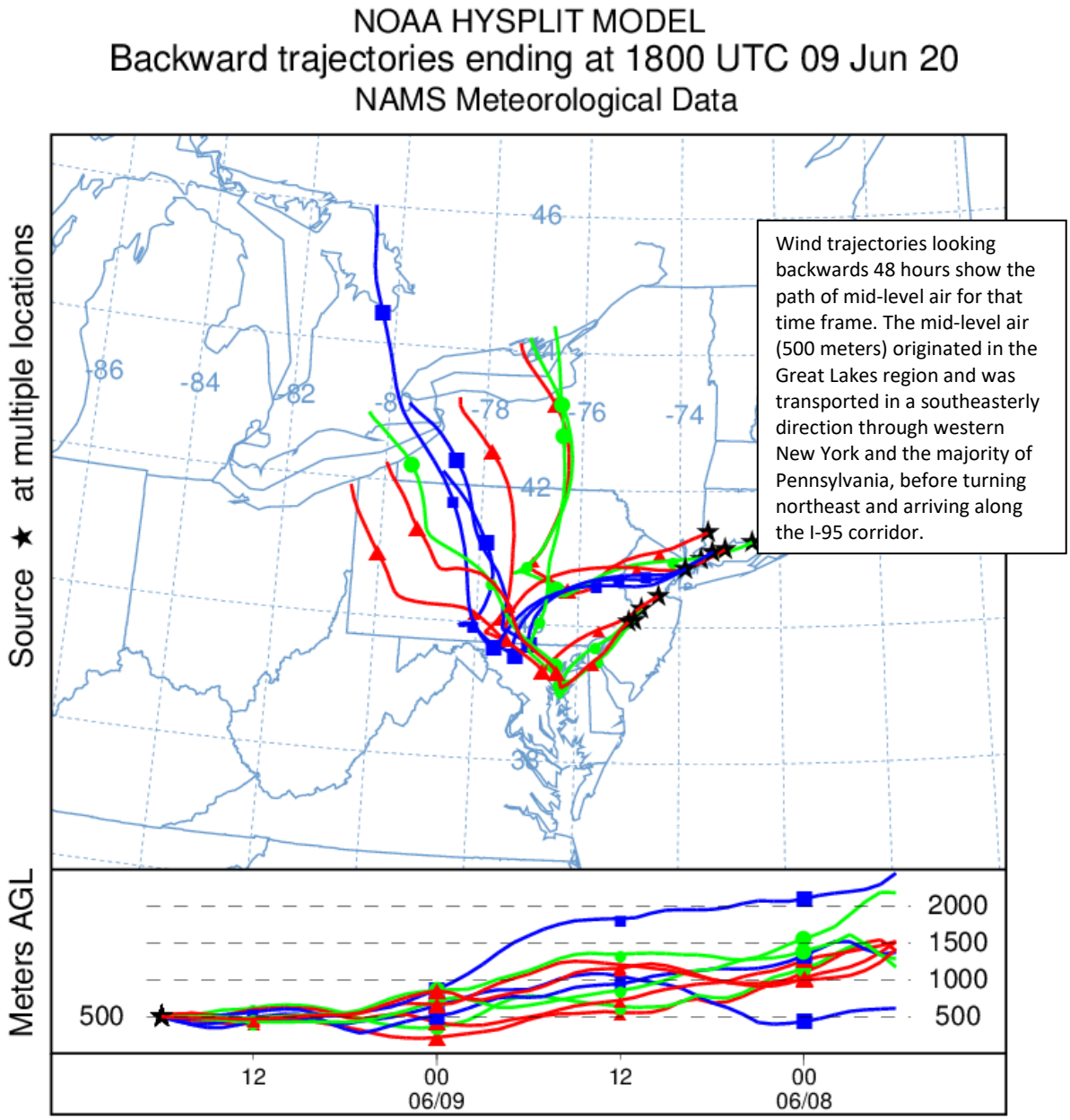


Figure 4. 48-hour Back Trajectories for June 9, 2020 at 1500 meters

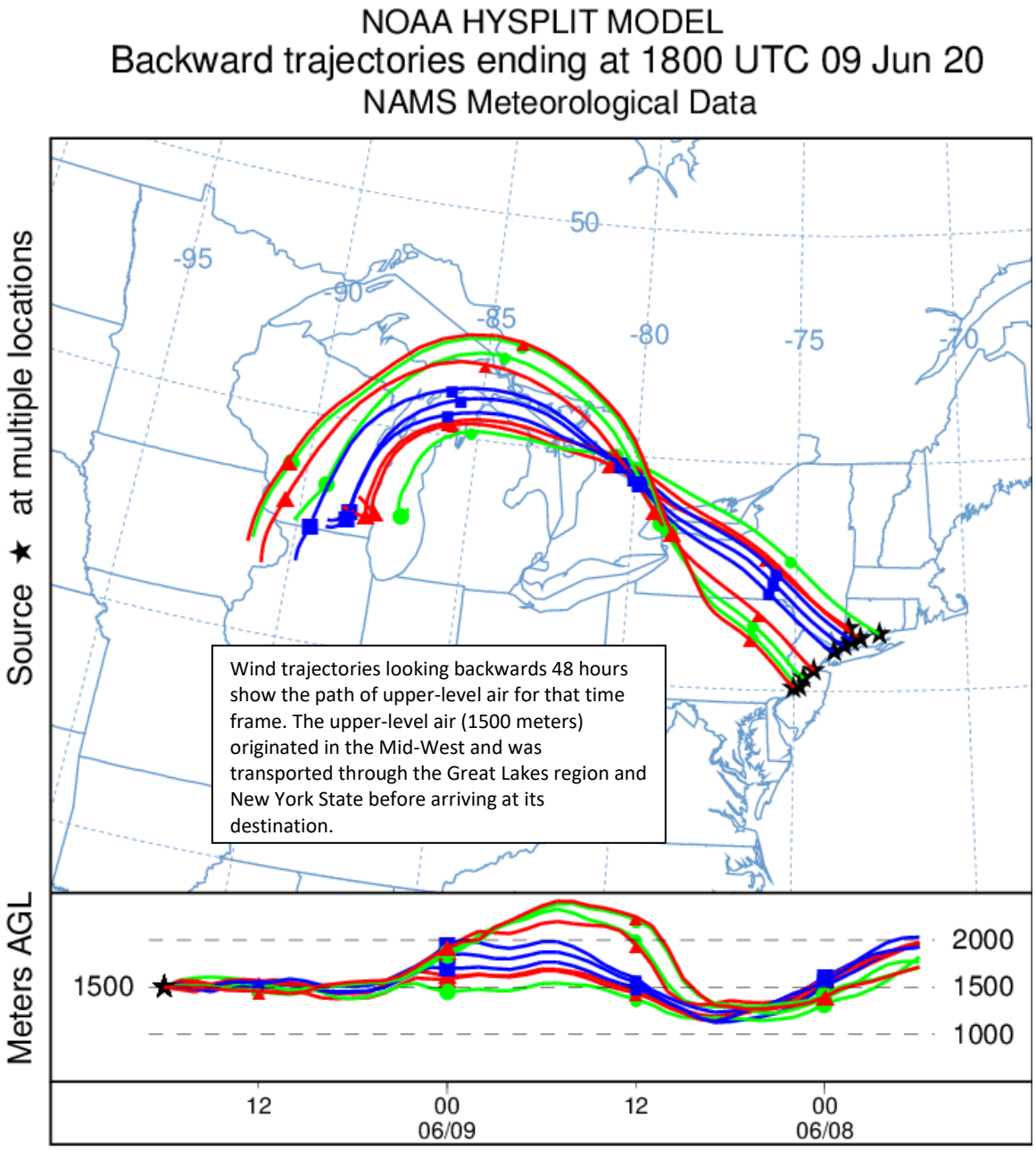
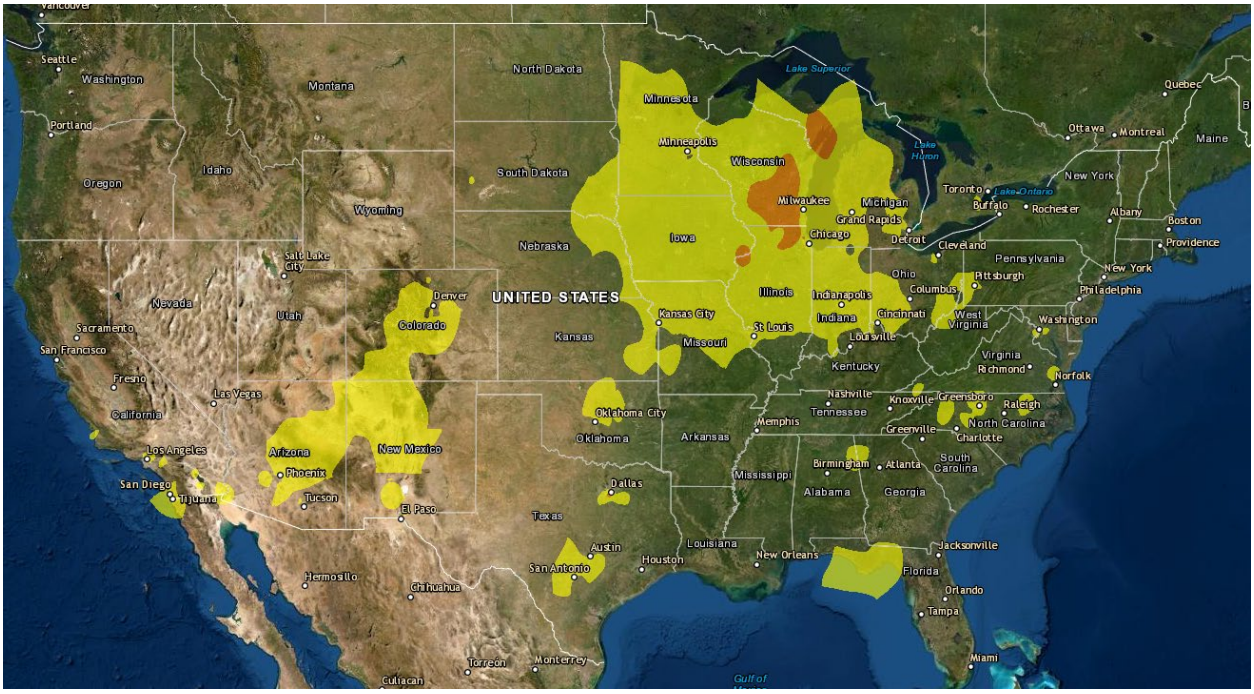


Figure 5. Combined Air Quality Index for the United States on June 8, 2020



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

Learn more about your local ozone air quality forecast by visiting the "What's Your Air Quality Today?" page at http://www.nj.gov/dep/cleanairnj/ .