Ozone National Ambient Air Quality Standard Health Exceedances on June 29, 2021

Exceedance Locations and Levels

On Tuesday, June 29, 2021, 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 6/29/2021

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	35
Bayonne	63
Brigantine	27
Camden Spruce St	45
Chester	44
Clarksboro	36
Colliers Mills	38
Columbia	54
Flemington	45
Leonia	52
Millville	33
Monmouth University	40
Newark Firehouse	49
Ramapo	46
Rider University	60
Rutgers University	60
Washington Crossing*	49
TOTAL EXCEEDANCES	0

*The Washington Crossing station is operated and maintained by EPA as part of the nationwide Clean Air Status and Trends Network (CASTNET).

From the out-of-state stations within New Jersey's ozone nonattainment areas, there were five (5) exceedances of the ozone NAAQS. See Table 2.

Table 2. Ozone Concentrations at Out-of-State Monitoring Stations in New Jersey's Ozone Nonattainment Areas on 6/29/2021

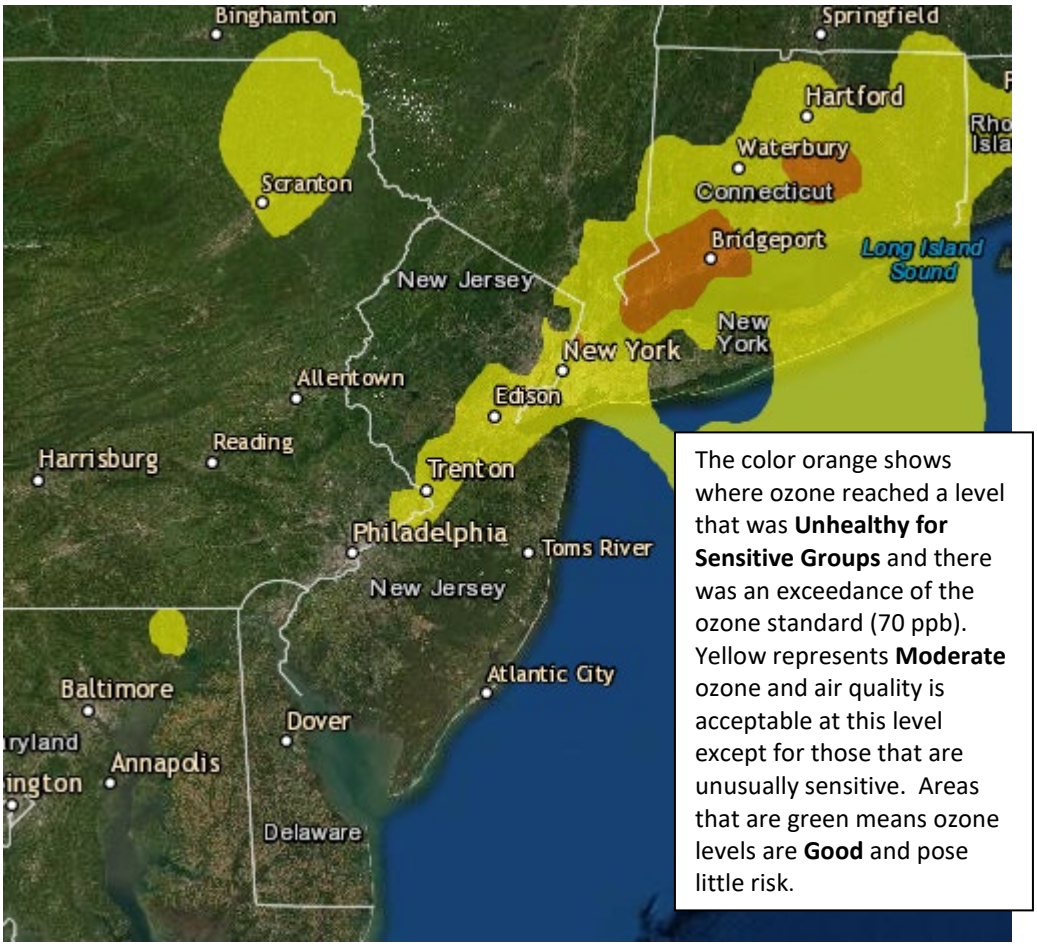
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	66
CT	Greenwich	77
CT	Madison-Beach Road	69
CT	Middletown-CVH-Shed	74
CT	New Haven	62
CT	Stratford	72
CT	Westport	80
DE	BCSP (New Castle Co.)	39
DE	BELLFNT2 (New Castle Co.)	39
DE	KILLENS (Kent Co.)	31
DE	LEWES (Sussex Co.)	27
DE	LUMS 2 (New Castle Co.)	38
DE	MLK (New Castle Co.)	40
DE	SEAFORD (Sussex Co.)	24
MD	Fair Hill	50
NY	Babylon	52
NY	Bronx - IS52	69
NY	CCNY	73
NY	Fresh Kills	62
NY	Holtsville	50
NY	Pfizer Lab	69
NY	Queens	55
NY	Riverhead	62
NY	Rockland Cty	53
NY	White Plains	67
PA	BRIS (Bucks Co.)	55
PA	CHES (Delaware Co.)	41
PA	NEWG (Chester Co.)	45
PA	NORR (Montgomery Co.)	43
PA	LAB (Philadelphia Co.)	41
PA	NEA (Philadelphia Co.)	54
PA	NEW (Philadelphia Co.)	51
	TOTAL EXCEEDANCES	5

The number of days in 2021 on which exceedances of the ozone NAAQS were recorded for all the states within New Jersey's ozone nonattainment areas is summarized in Table 3.

Table 3. Number of Days Ozone NAAQS was Exceeded in NJ's Nonattainment Areas in 2021

STATE	# of Days NAAQS was Exceeded January 1 – June 29, 2021 NAAQS = 70 ppb
Connecticut	8
Delaware	2
Maryland	2
New Jersey	5
New York	5
Pennsylvania	4

Figure 1. Ozone Air Quality Index for June 29, 2021



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

Hot and humid conditions continued as high pressure remained over the region. Weather conditions conducive to ozone formation, local and regional transport, as well as a build-up of pollutants, allowed ozone levels to build over the nonattainment area, with exceedances occurring in Connecticut and New York City.

A large area of high pressure centered over Bermuda continued to dominate the weather pattern across the nonattainment area. Southwest winds persisted throughout the day with sunny to partly sunny skies observed. Temperatures soared into the low to mid 90s across the region, making for another hot and humid day. Later in the afternoon, a surface trough developed over New York City, Long Island, and Connecticut, which helped mix any pollutants aloft down to the surface. All these meteorological conditions are conducive for ozone formation, and this allowed ozone levels to increase over the region. Southwest winds aided in the transport of local and regional emissions along the I-95 corridor. Additionally, the high pressure over the region had allowed for pollutants to build during the prior day, further adding to the deterioration in air quality.

Thus, the exceedances observed in the areas of coastal Connecticut and New York City can be attributed to a previously polluted air mass, favorable meteorological conditions allowing for ozone formation, and the transport of pollutants along the I-95 corridor.

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 June 29, 2021. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Five monitoring stations were chosen to model back trajectories and are listed in Table 4.

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	Greenwich	77
CT	Middletown - CVH	74
CT	Stratford	72
CT	Westport	80
NY	CCNY	73

Back trajectories from June 29th show that the exceedances observed in New York City and Connecticut were heavily influenced by a persistent swath of high pressure over the eastern seaboard at all levels of the atmosphere. This favorable meteorological setup allowed for the transport of localized emissions from the I-95 corridor, the New York City metropolitan area, and Long Island to their exceedance locations. These meteorological conditions in combination with favorable transport patterns caused ozone concentrations to reach the unhealthy for sensitive groups (USG) category in New York City and Connecticut.

Surface-level back trajectories (Figure 2) show that air at the surface originated off the coast of North Carolina and traveled in a clockwise direction around the periphery of high pressure as it did the day prior. The trajectory ending at the CCNY monitor in New York City pushed further inland than the Connecticut trajectories, traversing over the Chesapeake Bay region, the Philadelphia metropolitan area, and finally up the I-95 corridor into the NYC metropolitan area. The trajectories ending in Connecticut remained offshore on the 27th and 28th before traversing along the New Jersey coastline early on the 29th. Southwesterly winds then transported the surface-level air through the NYC metropolitan area, Long Island, and the Long Island Sound where the air mass likely gathered any residual ozone from the day prior before arriving in Connecticut. All trajectories remained at the surface throughout the entirety of its path, allowing for the accumulation of local emissions from cars, trucks, and industry, as well as any residual ozone from the day prior.

The mid-level back trajectories (Figure 3) show that air originated over various portions of North Carolina, including coastal and offshore locations. Air then traveled generally north and northeast across the Mid-Atlantic region through June 28th / early June 29th as it was steered along the periphery of the previously mentioned high pressure system. Finally, air converged over the Northern New Jersey/NYC metropolitan area on June 29th and traveled slowly northeastward into arrival.

In Figure 4, upper-level back trajectories originated over parts of North Carolina, Virginia, and Indiana, and were highly influenced by a high-pressure system, generally traveling in a clockwise direction. The parcels traversed throughout parts of the Ohio River Valley, Pennsylvania, and over the NYC metropolitan area before arriving at their endpoints. Although the upper-level flow was heavily influenced by high pressure, it did not show signs of sinking, as the parcels were also influenced by a stationary front. This resulted in rising motions at upper levels in the atmosphere. The air parcels were steered by strong upper-level winds, traveling from as far as Indiana to the nonattainment area in less than 48 hours, indicating that the exceedances in Connecticut most likely occurred as a localized event due to a buildup of pollutants over several days in our region.

Figure 5 shows the National Air Quality Index observed on June 28th, the day prior to this exceedance event. As the figure shows, the area saw widespread good air quality, except for the NYC metropolitan center and portions of Connecticut where USG ozone levels were observed on the previous day as well. This suggests that there was little upwind contribution of regionally polluted air to the high ozone concentrations in Connecticut and New York, and it is likely that localized transport was a large factor driving ozone concentrations into the USG range specifically at the exceedance locations. This relatively clean airmass helped to keep ozone concentrations below the unhealthy for sensitive groups category throughout the majority of the nonattainment area except for portions of New York and Connecticut, where favorable meteorological conditions and local emissions led to multiple exceedances of the 8-hour ozone standard.

Figure 2. 48-hour Back Trajectories for June 29, 2021 at 10 meters

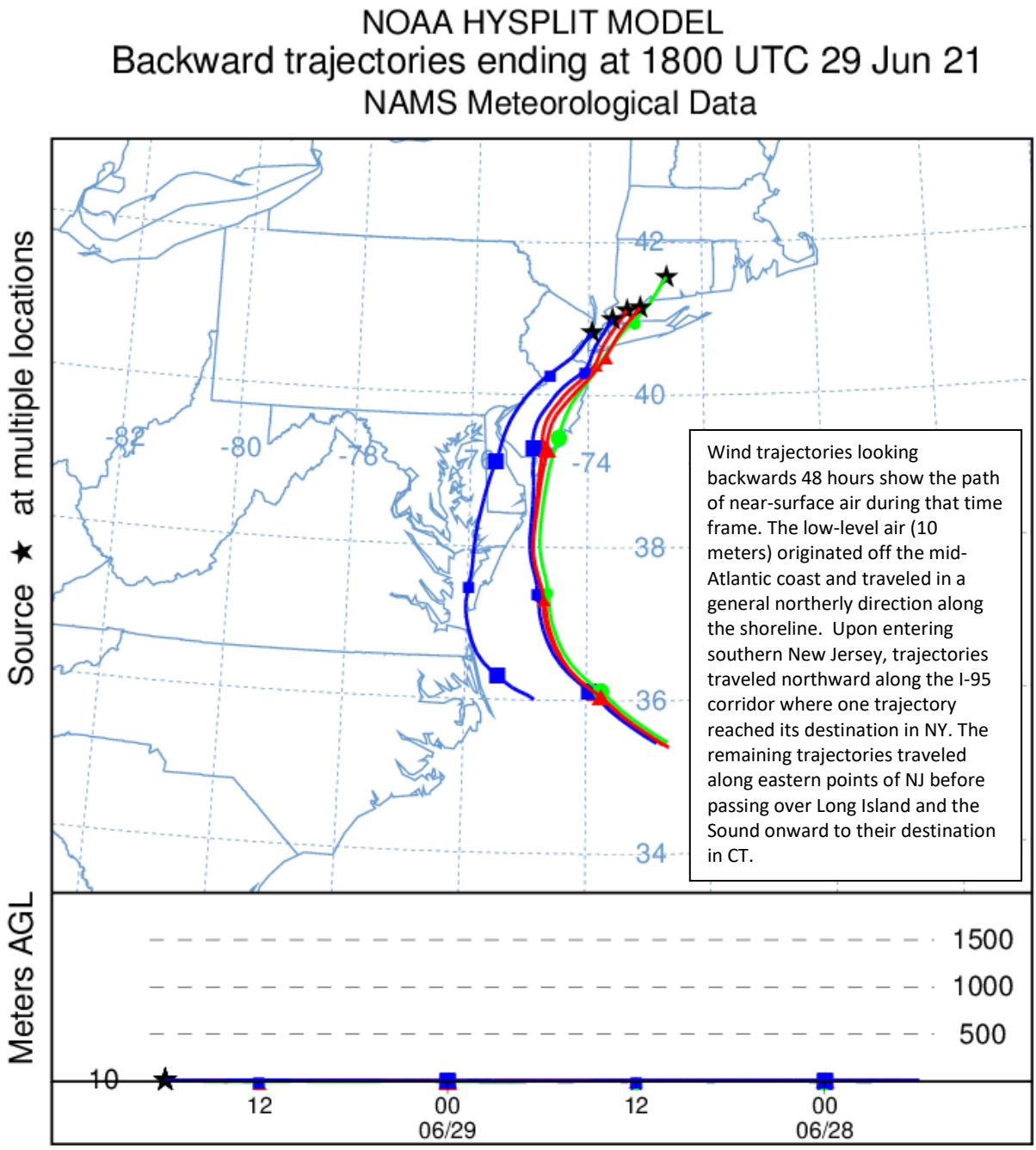
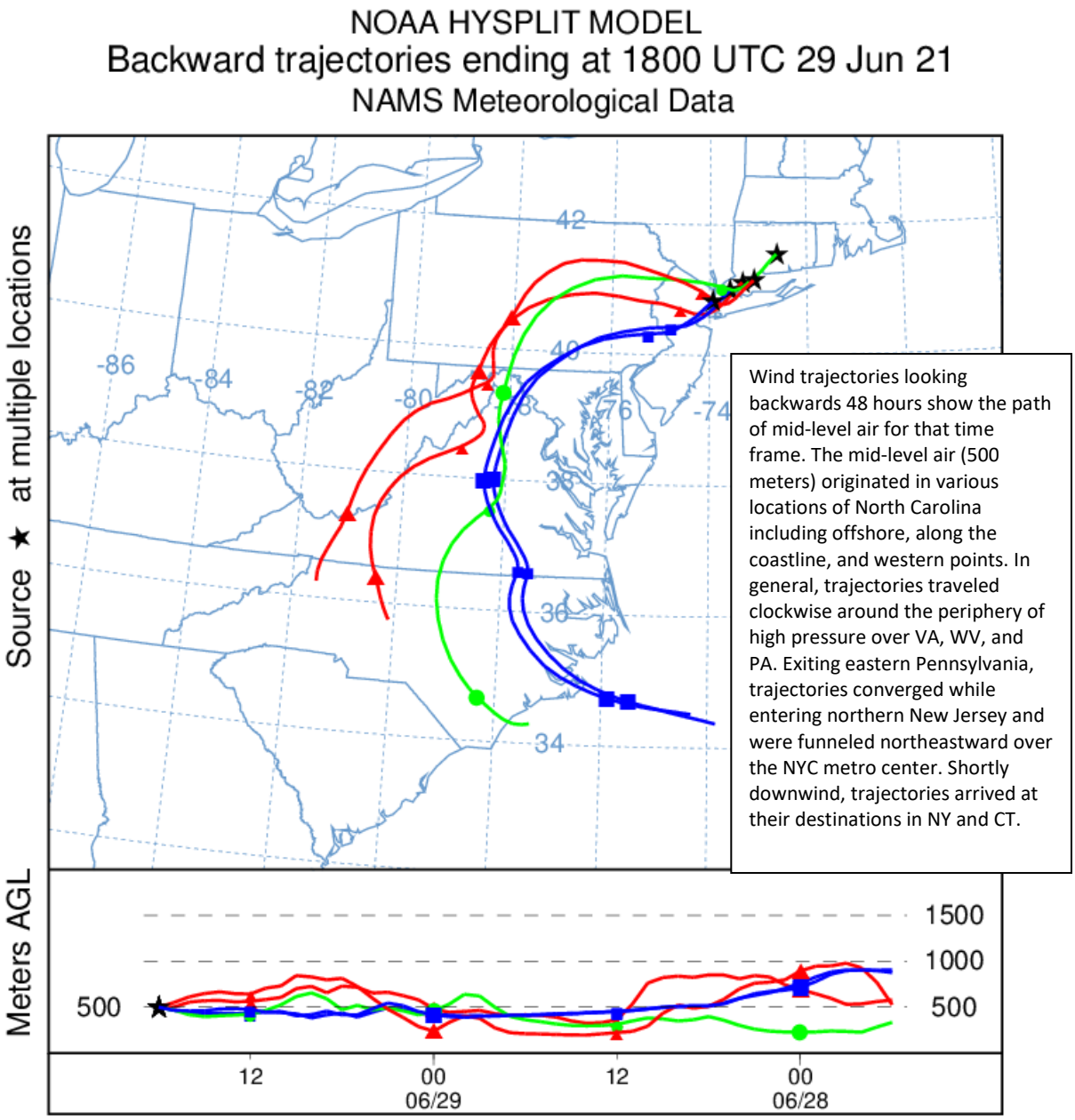


Figure 3. 48-hour Back Trajectories for June 29, 2021 at 500 meters



Wind trajectories looking backwards 48 hours show the path of mid-level air for that time frame. The mid-level air (500 meters) originated in various locations of North Carolina including offshore, along the coastline, and western points. In general, trajectories traveled clockwise around the periphery of high pressure over VA, WV, and PA. Exiting eastern Pennsylvania, trajectories converged while entering northern New Jersey and were funneled northeastward over the NYC metro center. Shortly downwind, trajectories arrived at their destinations in NY and CT.

Figure 4. 48-hour Back Trajectories for June 29, 2021 at 1500 meters

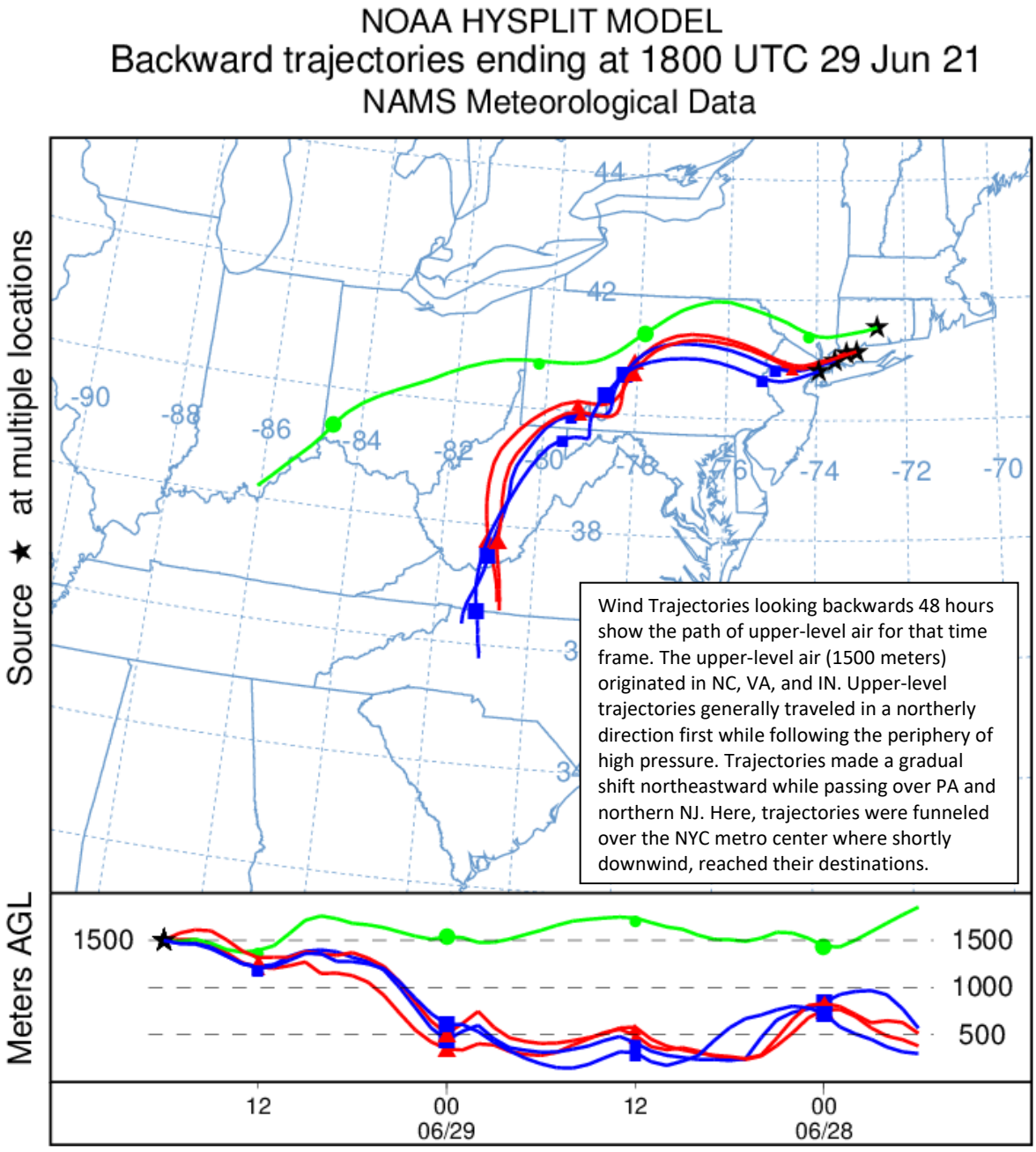
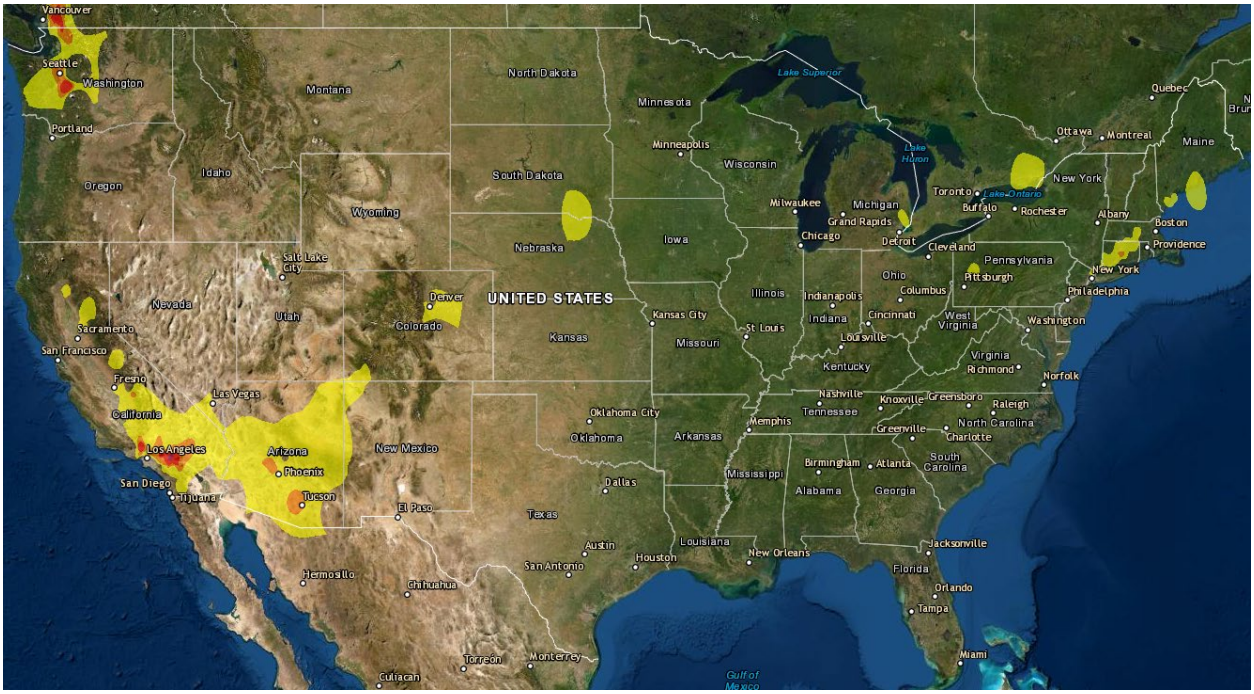


Figure 5. Combined Air Quality Index for the United States on June 28, 2021



Source: www.airnow.gov

How is Ozone Created?

Ground-level ozone is an air pollutant known to cause several 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/ .