Ozone National Ambient Air Quality Standard Health Exceedances on June 19, 2021

Exceedance Locations and Levels

On Saturday, June 19, 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 6/19/2021

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	53
Bayonne	55
Brigantine	50
Camden Spruce St	57
Chester	52
Clarksboro	59
Colliers Mills	61
Columbia	46
Flemington	56
Leonia	65
Millville	53
Monmouth University	58
Newark Firehouse	55
Ramapo	44
Rider University	57
Rutgers University	55
Washington Crossing*	52
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 three (3) 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 6/19/2021

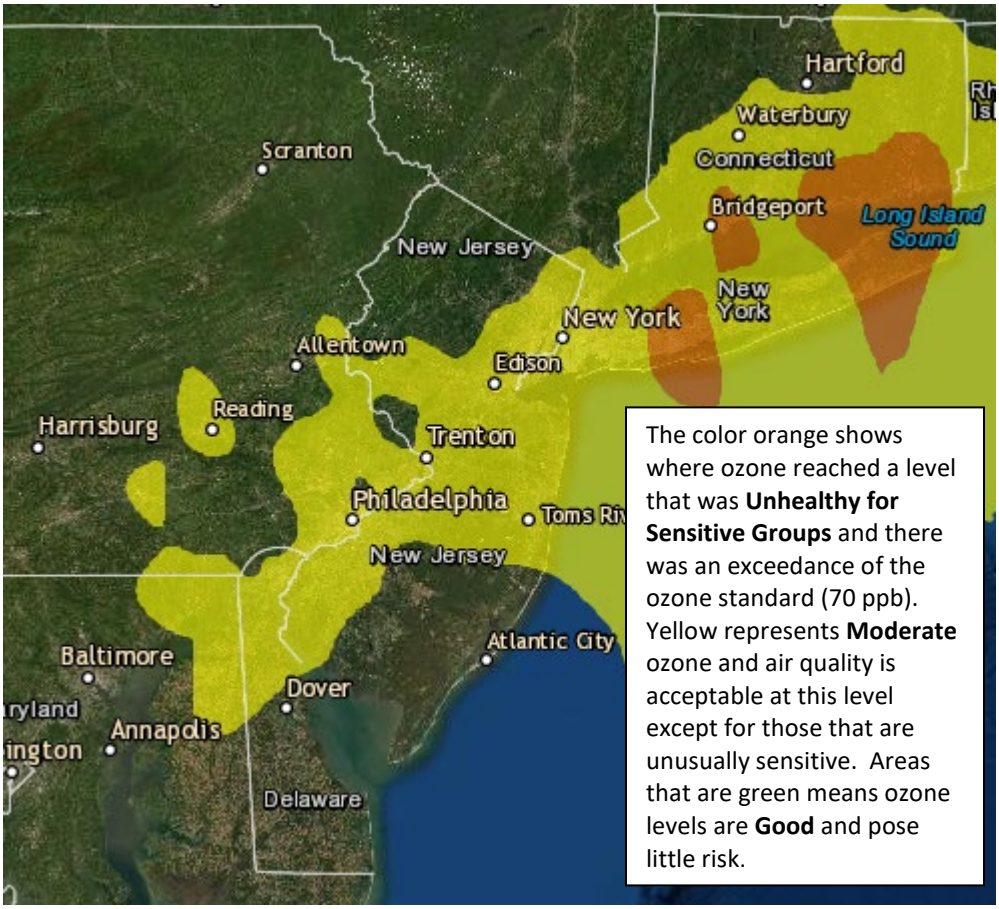
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	54
CT	Greenwich	64
CT	Madison-Beach Road	81
CT	Middletown-CVH-Shed	61
CT	New Haven	61
CT	Stratford	73
CT	Westport	66
DE	BCSP (New Castle Co.)	49
DE	BELLFNT2 (New Castle Co.)	56
DE	KILLENS (Kent Co.)	51
DE	LEWES (Sussex Co.)	47
DE	LUMS 2 (New Castle Co.)	56
DE	MLK (New Castle Co.)	58
DE	SEAFORD (Sussex Co.)	47
MD	Fair Hill	55
NY	Babylon	72
NY	Bronx - IS52	59
NY	CCNY	57
NY	Fresh Kills	59
NY	Holtsville	69
NY	Pfizer Lab	58
NY	Queens	65
NY	Riverhead	68
NY	Rockland Cty	48
NY	White Plains	53
PA	BRIS (Bucks Co.)	60
PA	CHES (Delaware Co.)	57
PA	NEWG (Chester Co.)	46
PA	NORR (Montgomery Co.)	59
PA	LAB (Philadelphia Co.)	49
PA	NEA (Philadelphia Co.)	58
PA	NEW (Philadelphia Co.)	59
	TOTAL EXCEEDANCES	3

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 19, 2021 NAAQS = 70 ppb
Connecticut	6
Delaware	2
Maryland	2
New Jersey	5
New York	4
Pennsylvania	4

Figure 1. Ozone Air Quality Index for June 19, 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

High pressure that dominated the weather pattern for several days gradually weakened as an area of low pressure over the Great Lakes region lifted northeast throughout the day on June 19th, 2021. An associated warm front passed over New England early as a surface trough developed in its wake, stretching from Maine southwestward into the Mid-Atlantic region. This complex weather pattern allowed for the local and regional transport of emissions and polluted air, leading to multiple ozone exceedances in the Long Island Sound vicinity.

High pressure gradually weakened over the Mid-Atlantic region on June 19th as a complex frontal system began to influence the nonattainment area. A warm front pushed through portions of northern New Jersey, New York, and southern New England early in the day. As this front quickly lifted north, a surface trough developed over the region, extending from New England southwestward into the Mid-Atlantic. This surface trough persisted throughout the day, allowing for late afternoon/evening showers and thunderstorms for much of the nonattainment area. Overall, temperatures were warm throughout region on this day, reaching the mid-upper 80s to 90s in some locations, and winds tended from the southwest, varying westerly at times. Meanwhile, cloud cover varied throughout the nonattainment area under the influence of the surface trough. Locations in the southern nonattainment area observed more cloud cover throughout the day while locations to the north, specifically the Long Island Sound, saw more of a mix of sun and clouds in the afternoon hours. It was this period of sunshine that could have supported ozone transport and formation in this region. Additionally, with the late evening thunderstorms, any ozone aloft that was transported into the region, had an opportunity to be mixed toward the surface, further enhancing levels in this location.

The multiple ozone exceedances in the vicinity of the Long Island Sound can be attributed to the localized and regional transport of emissions and previously polluted air into a location most favorable for ozone formation.

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 19, 2021. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Three 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	Madison Beach Road	81
CT	Stratford	73
NY	Babylon	72

Back trajectories from June 19th show that exceedances observed in the nonattainment area were influenced by the transport from regions that saw widespread moderate, and isolated USG air quality in the days leading up to this event. Additionally, the region was under the influence of a well-established area of high pressure that had become polluted in the days prior. Meanwhile, the transport of polluted air from the New York City metropolitan center likely influenced the ozone concentrations downwind in Connecticut and Long Island as well. All of this, in combination with a previously polluted air mass over the region and the favorable meteorological conditions mentioned above, led to air quality reaching the unhealthy for sensitive groups (USG) category in Connecticut and New York.

Surface-level back trajectories (Figure 2) show air at the surface originated off the coast of Virginia and traveled northward along the Atlantic coastline while grazing the New Jersey shoreline. Trajectories at the surface then passed over the New York City metropolitan center where it likely picked up emissions from cars, trucks, and industry. Upon reaching the city, trajectories then crossed through Long Island and The Sound, where peaking units may have been operating on this day and further deteriorating an already polluted air mass. One trajectory arrived at its destination in Babylon, New York while two other trajectories continued into Connecticut where exceedances were observed along the Connecticut coastline.

Mid-level trajectories (Figure 3) originated in Kentucky and Tennessee and traveled in a general northeasterly direction around the periphery of high pressure through Ohio and Pennsylvania/New York. Here, trajectories likely picked up emissions from industry while passing over this industrialized area. Trajectories at the mid-levels converged over northern New Jersey where they encountered a surface trough in the NYC metropolitan area. It is likely at this time; polluted air aloft was mixed down to the surface and contributed to an already polluted air mass. After exiting the NYC metropolitan area, trajectories traveled a short distance downwind to the three exceedance locations in Connecticut and Long Island.

Upper-level back trajectories (Figure 4) originated in the Mid-West and traveled gently in a northeasterly direction into the Great Lakes where widespread moderate and USG air quality was observed during transit. From here, upper level trajectories traveled in a general easterly direction through the Great Lakes, and upstate New York. Upper level trajectories advanced through the lower Hudson Valley and from here, followed a similar transport pathway to lower level trajectories through the metropolitan center and Long Island before arriving at their endpoints.

Figure 5 shows the National Air Quality Index observed on June 18th, the day prior to this exceedance event. As shown in the figure, widespread areas of moderate and unhealthy for sensitive groups ozone was observed throughout much of the eastern United States. The localized and regional transport of ozone precursors and previously polluted air, in combination with favorable meteorological conditions mentioned previously, helped lead to three exceedances in the nonattainment area.

Figure 2. 48-hour Back Trajectories for June 19, 2021 at 10 meters

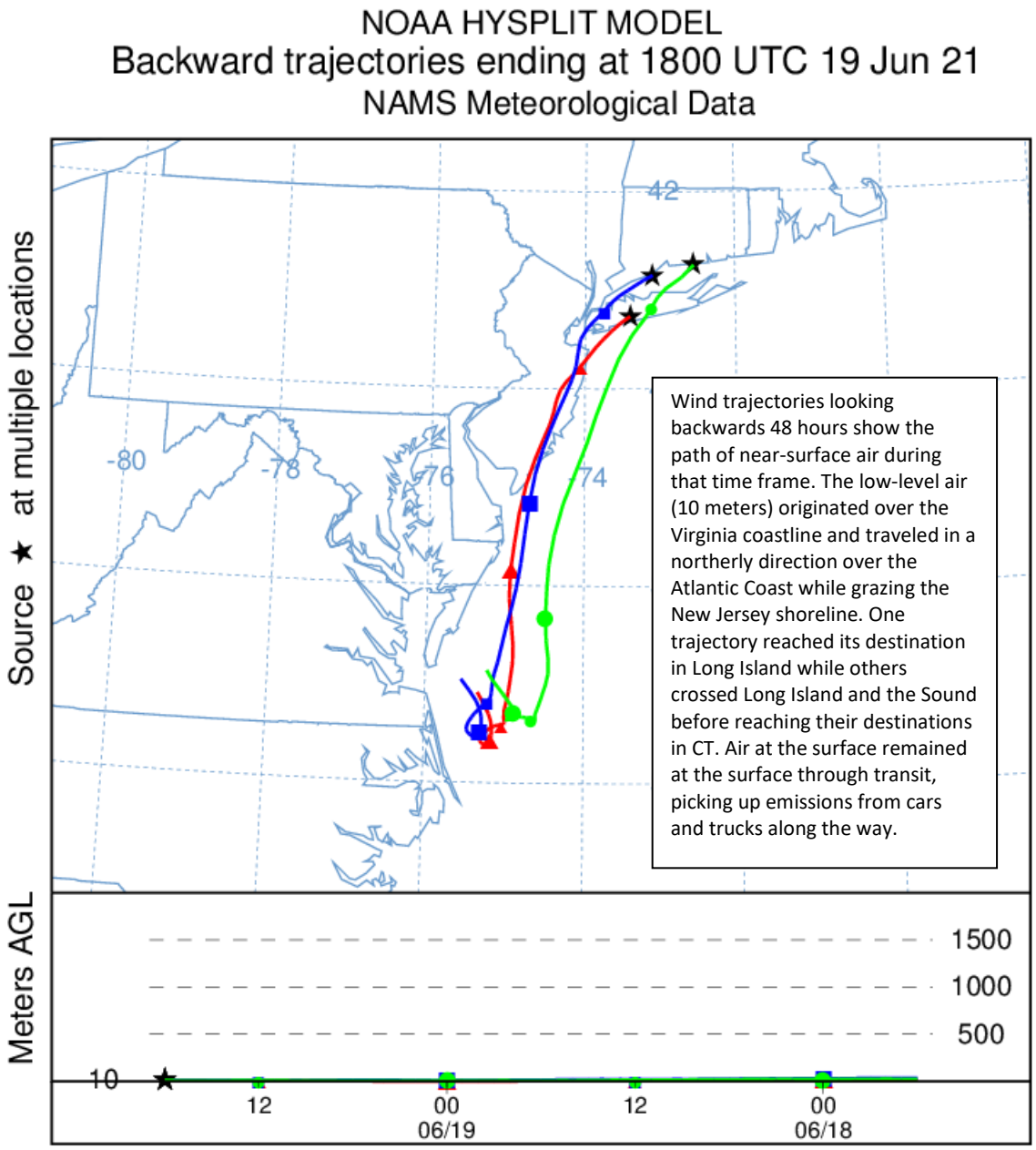


Figure 3. 48-hour Back Trajectories for June 19, 2021 at 500 meters

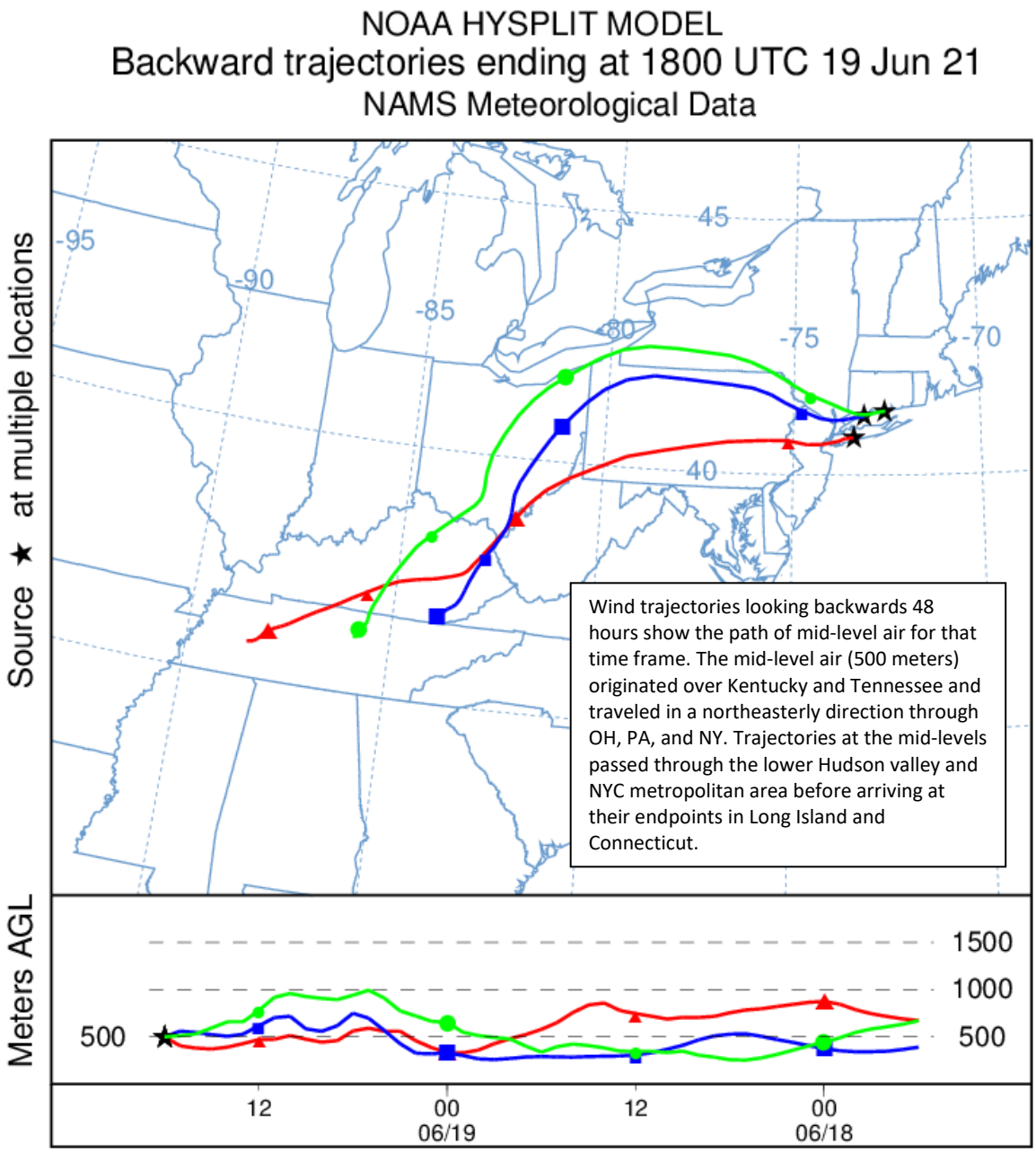


Figure 4. 48-hour Back Trajectories for June 19, 2021 at 1500 meters

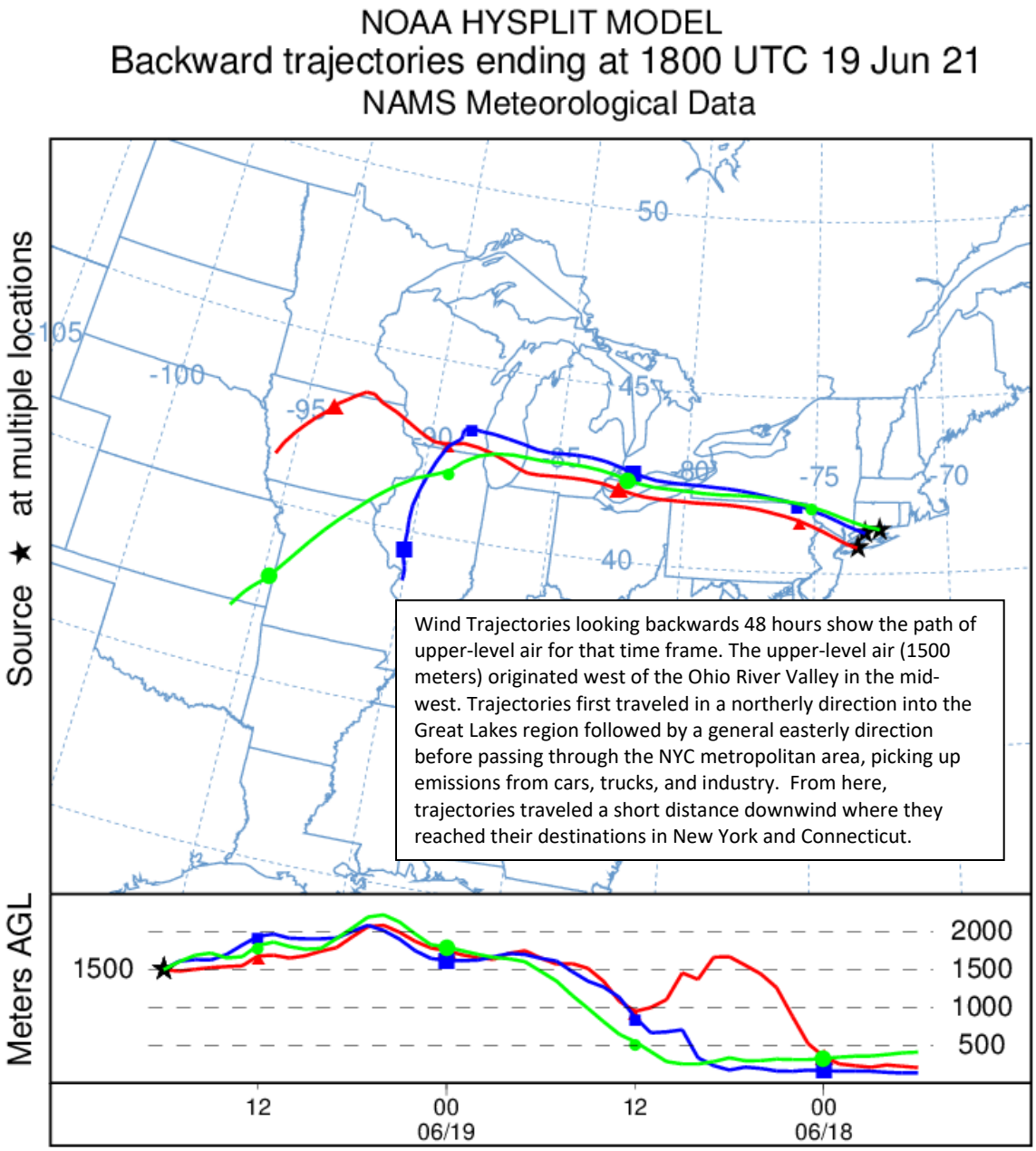
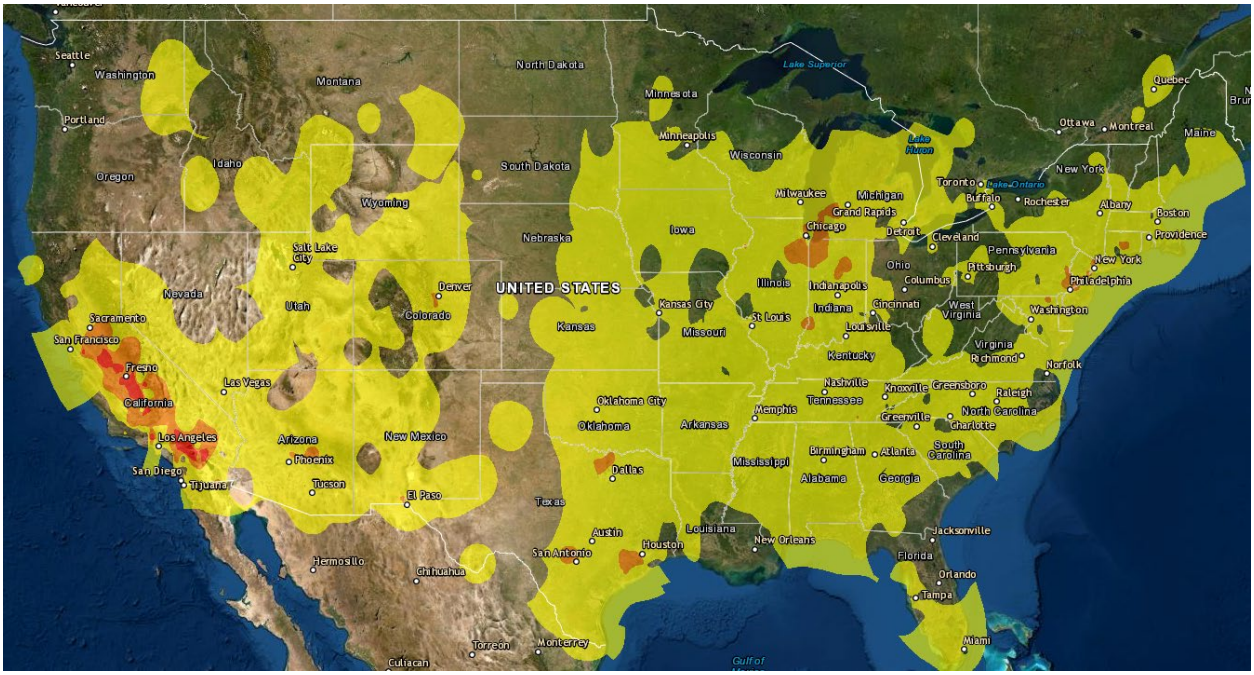


Figure 5. Combined Air Quality Index for the United States on June 18, 2021



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/ .