Ozone National Ambient Air Quality Standard Health Exceedances on July 6, 2021

On Tuesday, July 6, 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 7/6/2021

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	48
Bayonne	54
Brigantine	45
Camden Spruce St	62
Chester	52
Clarksboro	55
Colliers Mills	51
Columbia	46
Flemington	58
Leonia	45
Millville	47
Monmouth University	52
Newark Firehouse	57
Ramapo	49
Rider University	No Data
Rutgers University	58
Washington Crossing*	54
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 four (4) 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 7/6/2021

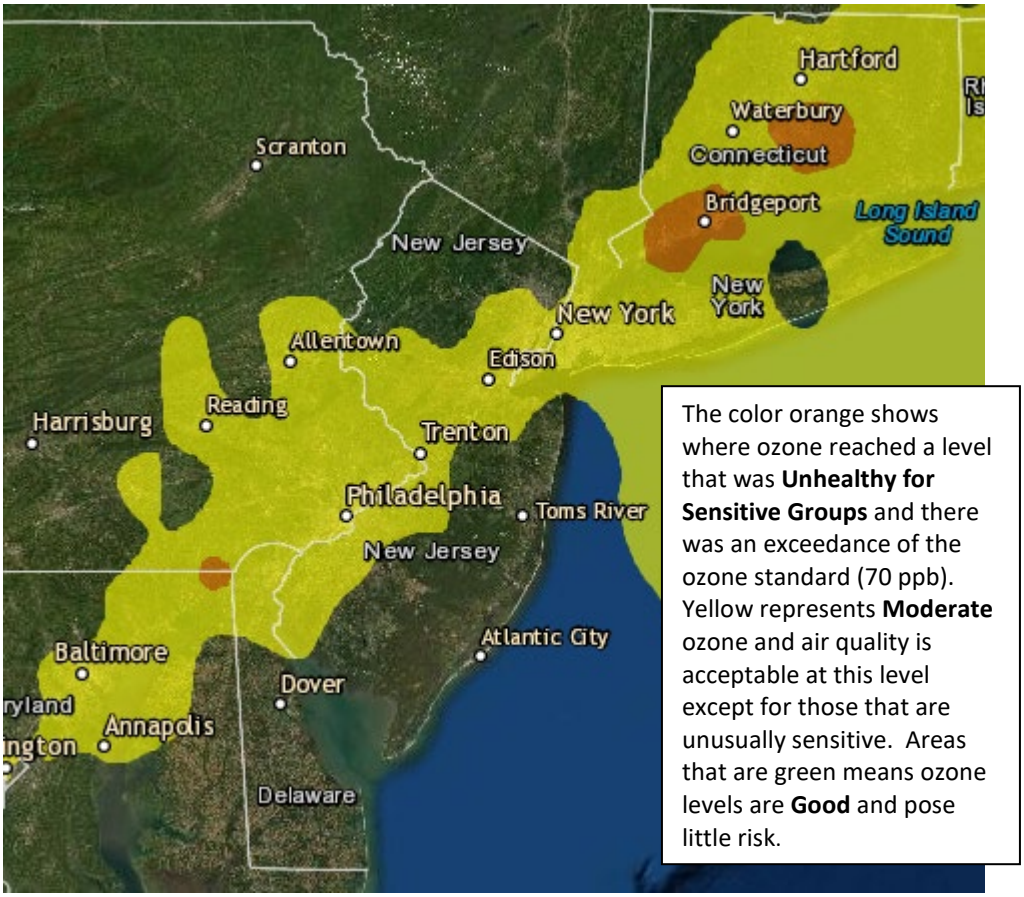
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	54
CT	Greenwich	70
CT	Madison-Beach Road	69
CT	Middletown-CVH-Shed	77
CT	New Haven	66
CT	Stratford	71
CT	Westport	78
DE	BCSP (New Castle Co.)	61
DE	BELLFNT2 (New Castle Co.)	61
DE	KILLENS (Kent Co.)	46
DE	LEWES (Sussex Co.)	No Data
DE	LUMS 2 (New Castle Co.)	58
DE	MLK (New Castle Co.)	64
DE	SEAFORD (Sussex Co.)	46
MD	Fair Hill	71
NY	Babylon	56
NY	Bronx - IS52	64
NY	CCNY	61
NY	Flax Pond	64
NY	Fresh Kills	60
NY	Holtsville	54
NY	Pfizer Lab	62
NY	Queens	70
NY	Riverhead	53
NY	Rockland Cty	51
NY	White Plains	61
PA	BRIS (Bucks Co.)	70
PA	CHES (Delaware Co.)	63
PA	NEWG (Chester Co.)	54
PA	NORR (Montgomery Co.)	54
PA	LAB (Philadelphia Co.)	60
PA	NEA (Philadelphia Co.)	65
PA	NEW (Philadelphia Co.)	67
	TOTAL EXCEEDANCES	4

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 – July 6, 2021 NAAQS = 70 ppb
Connecticut	10
Delaware	2
Maryland	3
New Jersey	5
New York	6
Pennsylvania	5

Figure 1. Ozone Air Quality Index for July 6, 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

Widespread high pressure anchored over the eastern United States created a favorable environment for the deterioration of air quality across the nonattainment zone on Tuesday, July 6th. These favorable weather conditions, as well as a previously polluted air mass at the surface and aloft, contributed to the ozone exceedances that occurred in Connecticut and Maryland.

A high-pressure system was anchored along the eastern seaboard in the Mid-Atlantic and southeastern U.S. while a low-pressure system was situated to the north in central Quebec. This synoptic setup allowed for southwesterly winds to funnel hot and humid air into the region, causing temperatures to soar into the mid 90's. Partly sunny skies in the morning gave way to mostly sunny skies by early afternoon, allowing ozone concentrations to increase. A defined surface trough associated with the low pressure in Quebec, was also located over the I-95 corridor throughout much of the day. This allowed any polluted air aloft to mix down to the surface and further enhance ozone levels. Despite a lack of high ozone concentrations in upwind states from the day prior, significant fine particulate pollution following the Fourth of July holiday weekend as well as wildfire smoke aloft was in place over much of the eastern United States. With the surface trough in place, it is possible that volatile organic compounds (VOCs) from wildfire smoke aloft were able to mix down and contribute to rising ozone levels at the surface. By early evening, strong thunderstorms began to push into the region from the northwest, potentially limiting any further ozone development in northern New Jersey and the Philadelphia metropolitan area. Despite all the favorable conditions mentioned above, it is possible, as has been noted on prior limited occasions, that the extreme heat may have also aided in limiting ozone production across the Garden State and could be a reason why exceedance locations were not as widespread across the nonattainment area.

The favorable meteorological conditions mentioned above in combination with a previously deteriorated air mass at the surface and aloft, allowed for ozone concentrations to reach the unhealthy for sensitive groups (USG) category across Connecticut and far northeastern Maryland.

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 6, 2021. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Four 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	Middletown CVH	77
CT	Stratford	71
CT	Westport	78
MD	Fair Hill	71

Back trajectories from July 6th show that air at the surface traveled along coastal locations while air at the upper levels was transported from locations west of New Jersey. These trajectories followed the exterior periphery of high pressure slowly exiting the region into the Atlantic. In general, at the surface, a regionally clean air mass was observed upwind in the days leading up to this high ozone event. As a result, much of the polluted air that arrived at the exceedance monitor locations could have been from local transport and sources.

The surface-level back trajectories (Figure 2) show that air originated along the coastline of Virginia/North Carolina and traveled northward over the Atlantic before entering southern New Jersey. Here, air made a slight turn north-northeast while traveling over coastal portions of New Jersey. This area remained relatively clean for the duration of the trajectory path as a southerly maritime influence provided clean air to coastal New Jersey. Upon exiting New Jersey, surface trajectories passed over Long Island and the Sound, where peaking units may have been operating on this day due to extreme hot and humid conditions. As a result, air at the surface likely picked up the bulk of its emissions from this area in combination with emissions from cars and trucks. Meanwhile, the single trajectory impacting northern Maryland originated over the Outer Banks and followed a similar north-northeasterly route while passing over eastern Virginia and the Chesapeake Bay region. Here, trajectories likely picked up emissions from cars, trucks, and industry as it traveled along at ground level for the duration of its path before arriving at its destination in Fair Hill, Maryland.

The mid-level back trajectories (Figure 3) show that air originated over Ohio for three of the trajectories while one trajectory originated over Virginia. The first three trajectories started in a southeast direction before moving eastward over West Virginia. From here, they moved over the West Virginia, Pennsylvania, and Maryland borders, where one trajectory reached its destination in Maryland. The rest moved in a northeastward direction over Pennsylvania and up the I-95 corridor, where they passed over New York City before reaching their destinations in Connecticut. The trajectory that originated over Virginia moved northward before merging with the other trajectories over Pennsylvania, where it followed a similar path up the I-95 corridor and over New York City before reaching its destination in Connecticut. The trajectories experienced a gradual sinking motion toward the end of their paths, allowing any ozone aloft to mix down to the surface.

In Figure 4, upper-level back trajectories originated over the Midwest, with the Maryland trajectory originating over Illinois and the others originating over Kansas and Missouri. The trajectories traveled clockwise along the high pressure that was in place over the region. The trajectory originating in Illinois traveled in a generally eastward direction until reaching its destination in Maryland. The rest of the trajectories traveled in a northeastward direction over the Great Lakes before turning easterly, where they eventually reached their destinations in Connecticut.

Figure 5 shows the National Air Quality Index observed on July 5th, the day prior to this exceedance event. As seen in the figure, the area saw widespread good air quality, except for isolated areas of moderate ozone concentrations observed in parts of Maryland, Pennsylvania, and northern New Jersey. This suggests there was no build-up of previously polluted air to increase ozone concentrations. This relatively clean airmass helped to keep ozone concentrations below the unhealthy for sensitive groups category throughout much of the nonattainment area except for portions of Maryland 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 July 6, 2021 at 10 meters

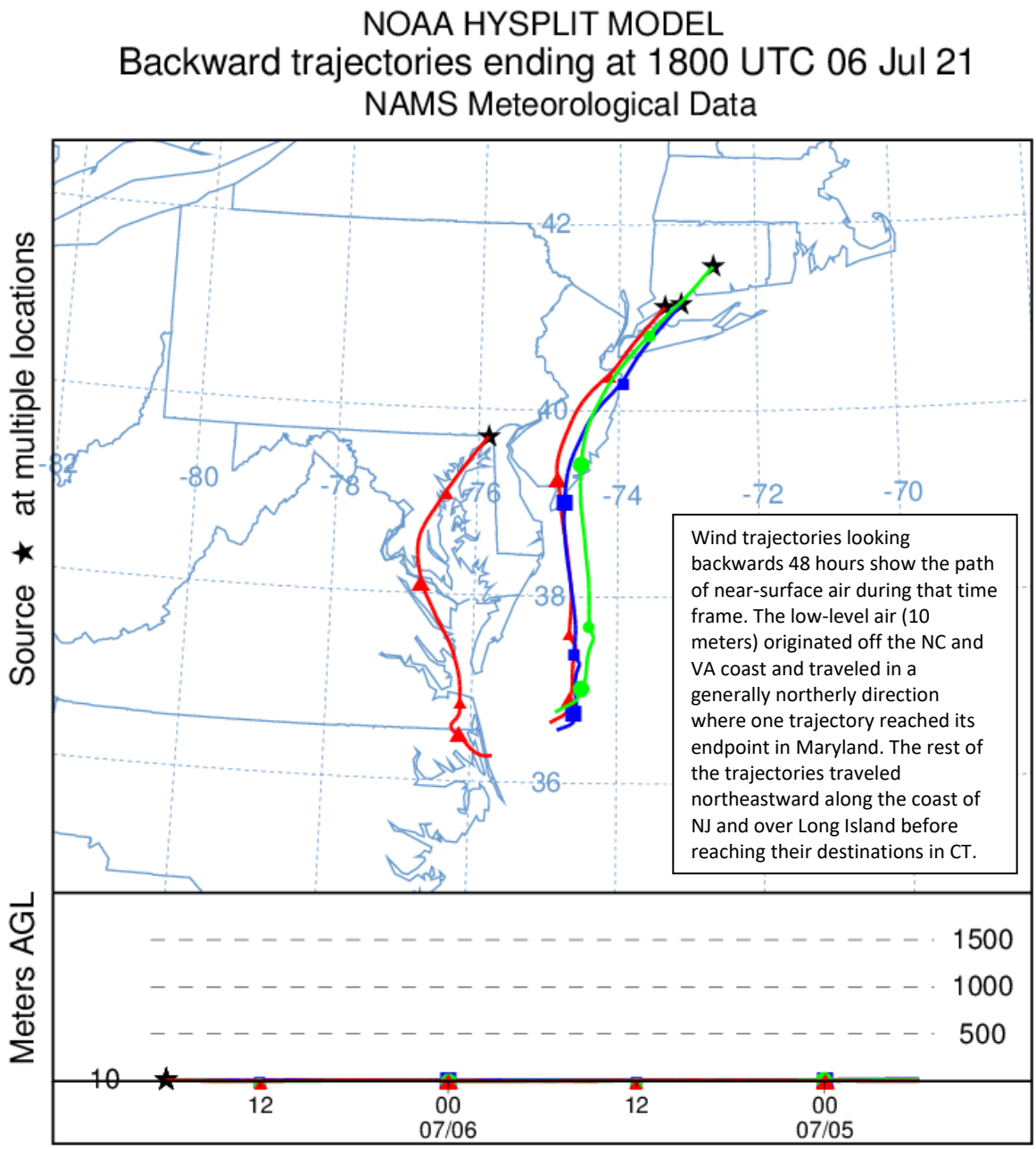


Figure 3. 48-hour Back Trajectories for July 6, 2021 at 500 meters

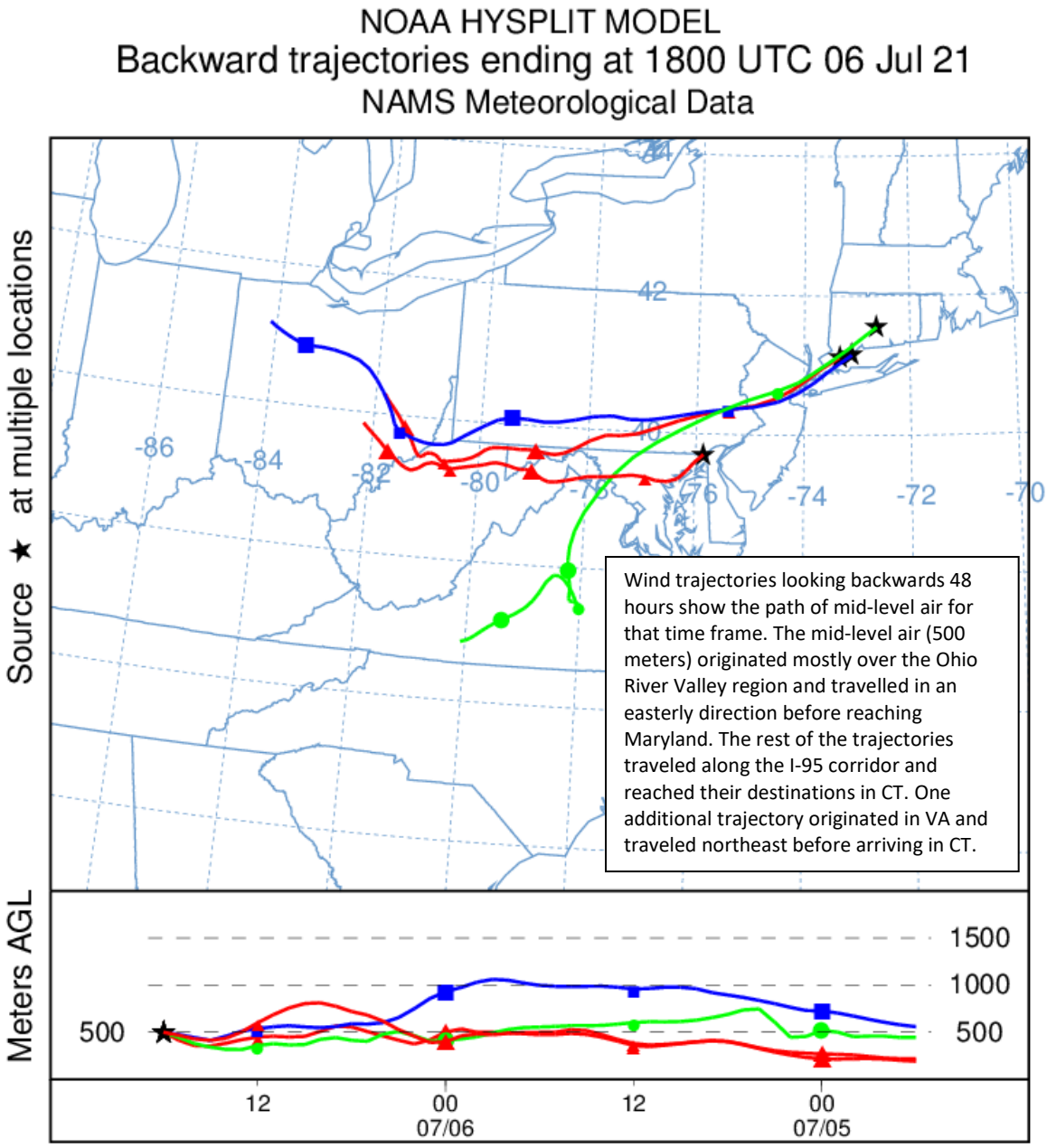


Figure 4. 48-hour Back Trajectories for July 6, 2021 at 1500 meters

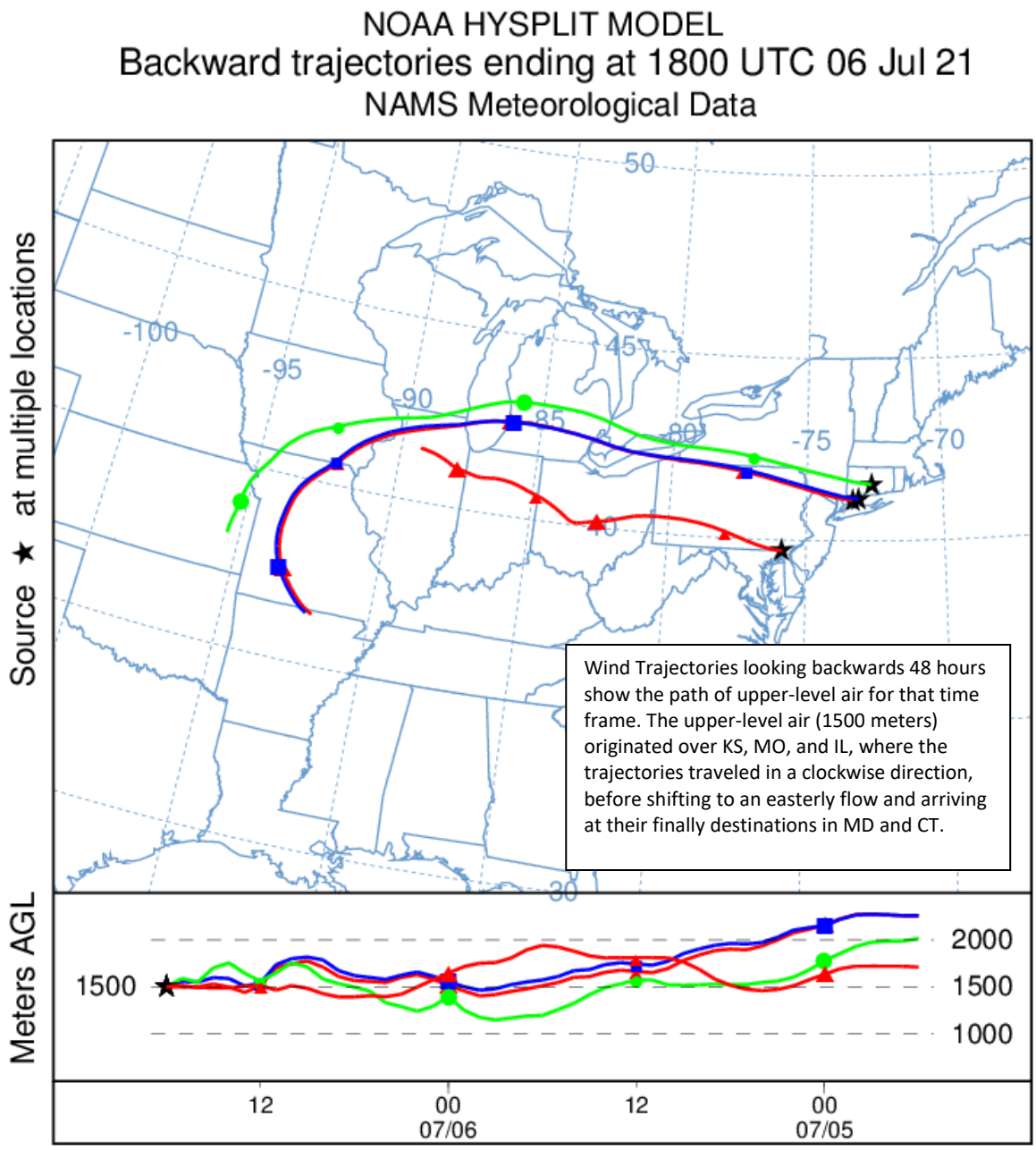
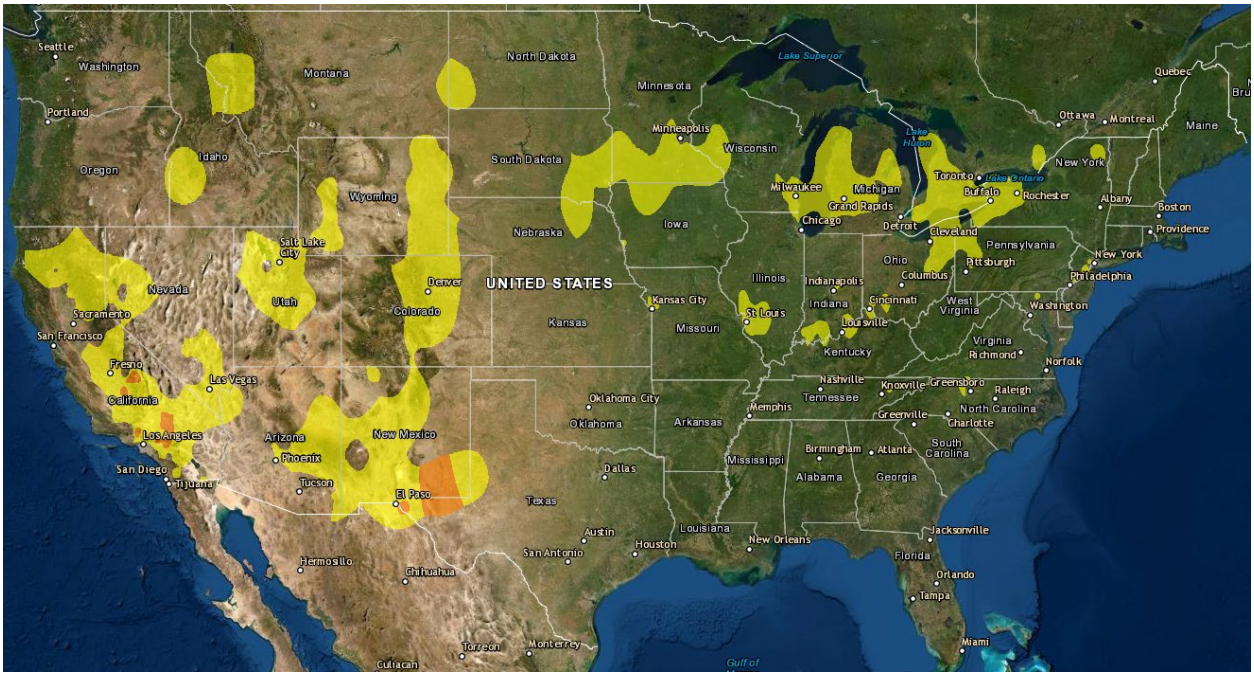


Figure 5. Combined Air Quality Index for the United States on July 5, 2021



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/ .