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

Exceedance Locations and Levels

On Sunday, June 6, 2021, there was one (1) exceedance 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 6/6/2021

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	57
Bayonne	70
Brigantine	50
Camden Spruce St	65
Chester	61
Clarksboro	59
Colliers Mills	61
Columbia	59
Flemington	65
Leonia	72
Millville	57
Monmouth University	58
Newark Firehouse	61
Ramapo	61
Rider University	70
Rutgers University	66
Washington Crossing*	65
TOTAL EXCEEDANCES	1

*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 fourteen (14) 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 6/6/2021

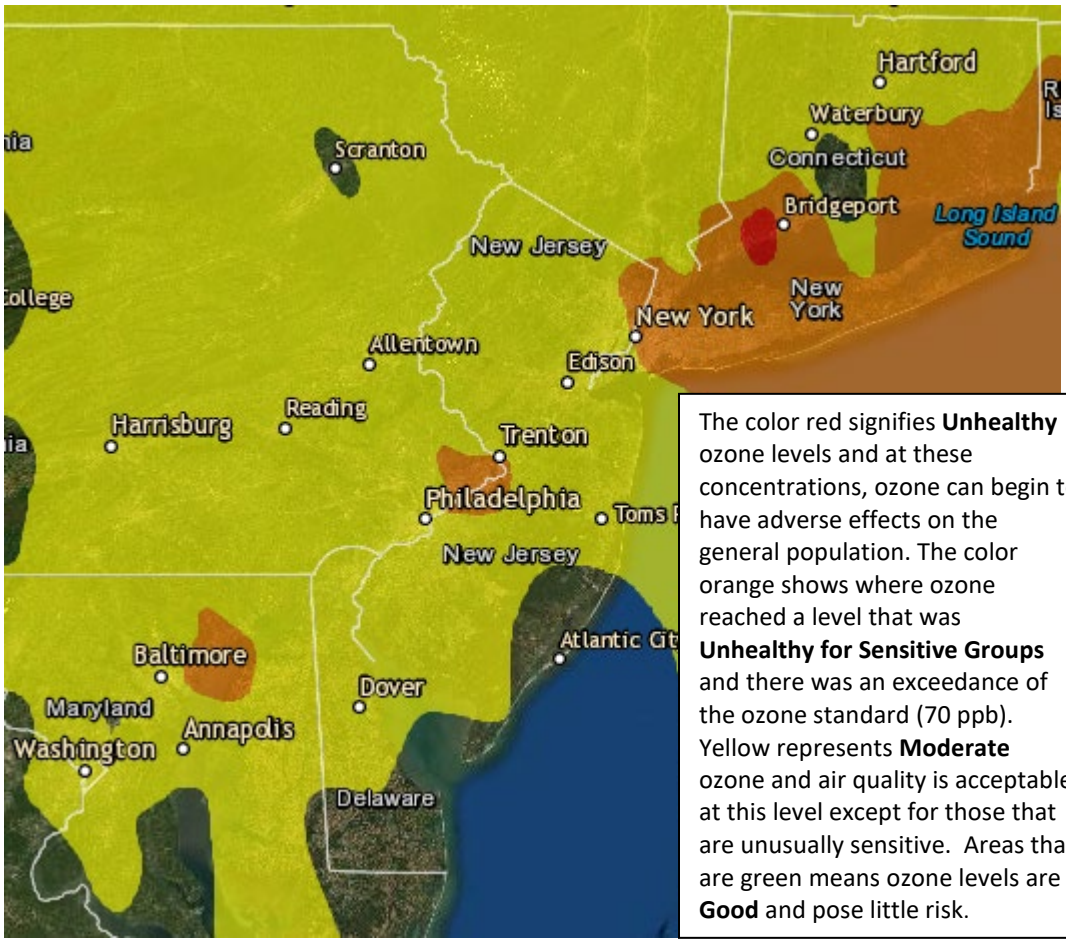
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	64
CT	Greenwich	82
CT	Madison-Beach Road	77
CT	Middletown-CVH-Shed	71
CT	New Haven	47
CT	Stratford	78
CT	Westport	86
DE	BCSP (New Castle Co.)	62
DE	BELLFNT2 (New Castle Co.)	60
DE	KILLENS (Kent Co.)	60
DE	LEWES (Sussex Co.)	49
DE	LUMS 2 (New Castle Co.)	60
DE	MLK (New Castle Co.)	65
DE	SEAFORD (Sussex Co.)	53
MD	Fair Hill	67
NY	Babylon	79
NY	Bronx - IS52	74
NY	CCNY	76
NY	Fresh Kills	No Data
NY	Holtsville	71
NY	Pfizer Lab	74
NY	Queens	74
NY	Riverhead	70
NY	Rockland Cty	61
NY	White Plains	67
PA	BRIS (Bucks Co.)	72
PA	CHES (Delaware Co.)	62
PA	NEWG (Chester Co.)	55
PA	NORR (Montgomery Co.)	70
PA	LAB (Philadelphia Co.)	66
PA	NEA (Philadelphia Co.)	72
PA	NEW (Philadelphia Co.)	72
	TOTAL EXCEEDANCES	14

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 6, 2021 NAAQS = 70 ppb
Connecticut	3
Delaware	2
Maryland	2
New Jersey	4
New York	2
Pennsylvania	3

Figure 1. Ozone Air Quality Index for June 6, 2021



The color red signifies **Unhealthy** ozone levels and at these concentrations, ozone can begin to have adverse effects on the general population. The color orange shows where ozone reached a level that was **Unhealthy for Sensitive Groups** and there was an exceedance of the ozone standard (70 ppb). Yellow represents **Moderate** ozone and air quality is acceptable at this level except for those that are unusually sensitive. Areas that are green means ozone levels are **Good** and pose little risk.

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

In the days leading up to this high ozone event, a high-pressure center established itself off the southeast U.S. coast. This expansive high remained in place leading to multiple days of hot and sunny weather. In addition, this pattern created an opportunity for pollutants at the surface to accumulate over several days while also providing localized and regional transport of ozone precursors from upwind states where polluted air was observed during the days prior. The combination of these factors led to several monitors across the nonattainment area reaching the unhealthy for sensitive groups (USG) category and one monitor along the Connecticut coastline reaching the unhealthy category.

Beginning on June 5th, high pressure positioned itself off the southeast U.S. coast, where it remained through June 6th. Favorable meteorological conditions for ozone production were present including light winds, brilliant sunshine, and temperatures soaring into the 90s. These conditions allowed for ozone levels to rise quickly along the Connecticut coastline and Long Island, where a large number of exceedances were observed. Additionally, locations in this area experienced a southwesterly surface winds that likely assisted a plume of polluted air from New York City downwind to Connecticut. A surface trough was also in place along the I-95 corridor and extended northward into Long Island and Connecticut. This trough likely aided in the mixing of polluted air aloft down to the surface and was a contributing factor to the rising ozone concentrations at the surface.

The ozone exceedances recorded in the nonattainment area can be attributed to favorable weather conditions for ozone formation as well as the combination of localized transport of emissions up the I-95 corridor and long-range transport of previously polluted air from the Mid-Atlantic region as well as points west, including the Ohio River Valley/Great Lakes.

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 6, 2021. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Ten 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	82
CT	Madison-Beach Road	77
CT	Westport	86
CT	Stratford	78
NY	Babylon	79
NY	CCNY	76
NY	Pfizer Lab	74
NJ	Leonia	72
PA	Bristol	72
PA	NEW	72

Back trajectories from June 6th show that exceedances observed in both the northern nonattainment area and the Philadelphia metropolitan area were influenced by a persistent high-pressure system over the region. The placement of this high pressure allowed for the transport of both localized emissions and previously polluted air into an environment favorable for ozone formation.

The surface level back trajectories (Figure 2) show that air at the surface originated in various locations, west and southwest of the nonattainment area. Air impacting portions of the Northern NJ/NYC metropolitan area and the Connecticut coastline originated over the Ohio River Valley region and quickly traveled east across southern Pennsylvania/Maryland through late June 5th before making a turn more northeast, traveling along the I-95 corridor into arrival. Meanwhile, air impacting the Philadelphia metropolitan area as well as Long Island tended to originate further east over the Mid-Atlantic region. This air traveled northeast for the duration of its path, slowly passing over the Chesapeake Bay region, Delaware, Philadelphia, and New Jersey respectively. In both scenarios, air traveled at the surface for much of its path, picking up not only emissions from cars, trucks, and industry but, transporting air from locations that saw elevated levels of ozone the day prior.

The mid- and upper-level back trajectories (Figures 3 & 4) show that air at these levels followed very similar paths as they were influenced by high pressure placement. Air at both levels, originated over the Ohio River Valley region and traveled generally east-northeast into arrival. Air passed over various portions of Pennsylvania and the Mid-Atlantic region while air impacting the northern nonattainment area also traveled over the Northern NJ/NYC metropolitan area. Additionally, both trajectories detected vertical motion was present as air traveled east. Not only did air experience an overall sinking motion, associated with high pressure, it was also influenced by a surface trough over West Virginia/Virginia that allowed for further mixing and an opportunity to bring previously polluted air toward the surface.

Figure 5 below shows the National Air Quality Index observed on June 5th, the day prior to this exceedance event. As shown in the figure, widespread areas of elevated ozone were observed across the northeastern United States and over the Ohio River Valley/Great Lakes regions. Both the localized/regional transport of ozone precursors and previously polluted air, in combination with favorable weather conditions helped lead to several ozone exceedances across the nonattainment area.

Figure 2. 48-hour Back Trajectories for June 6, 2021 at 10 meters

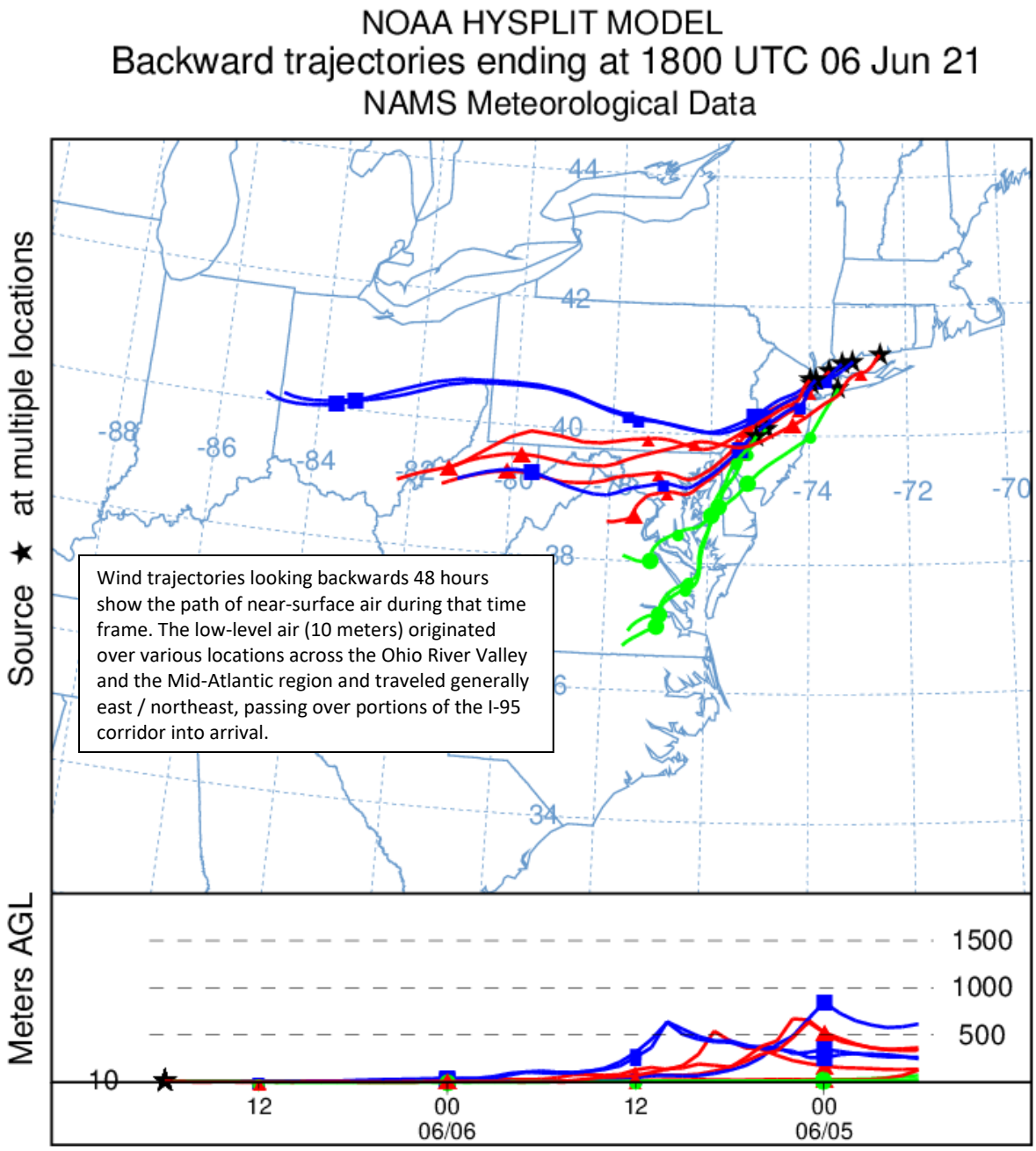


Figure 3. 48-hour Back Trajectories for June 6, 2021 at 500 meters

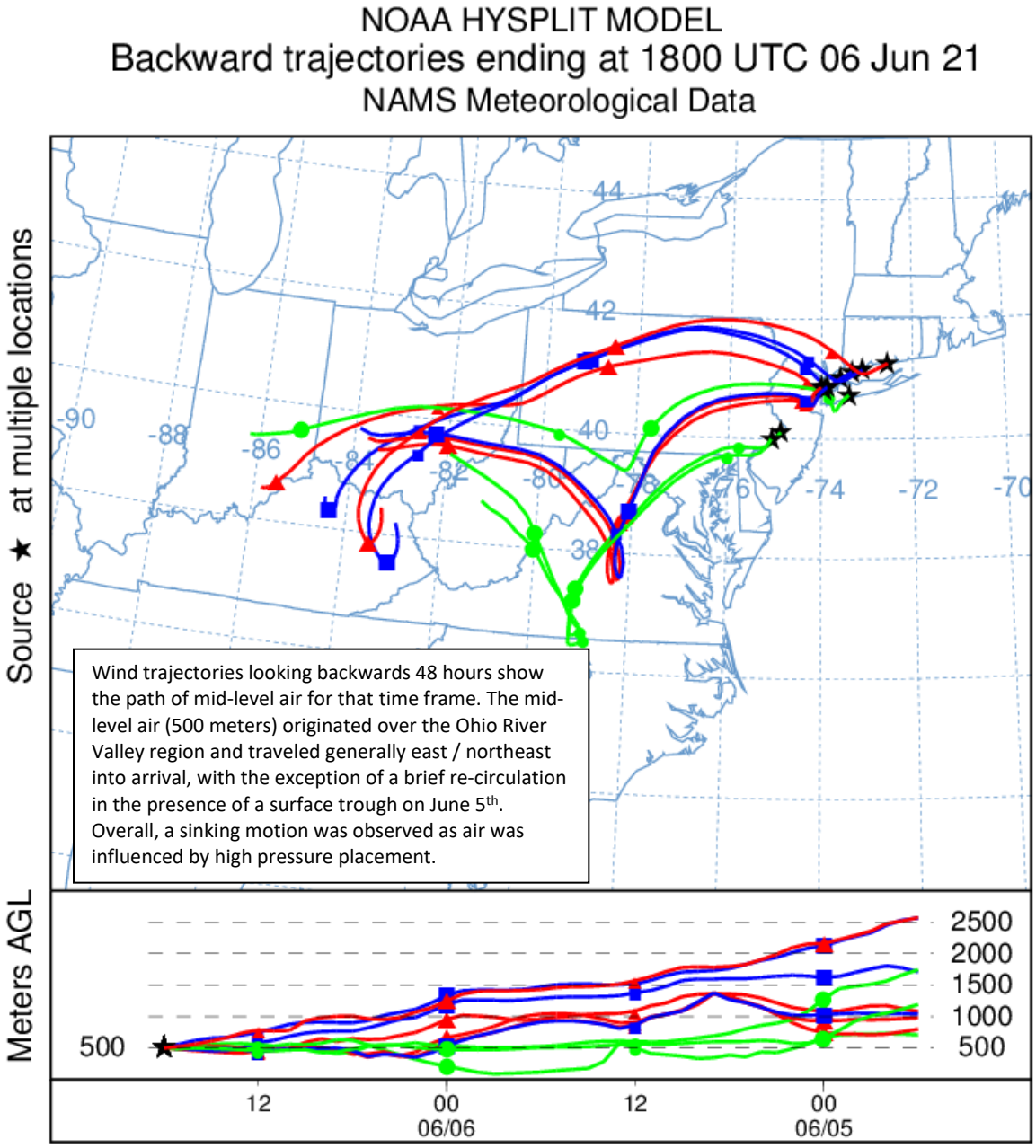


Figure 4. 48-hour Back Trajectories for June 6, 2021 at 1500 meters

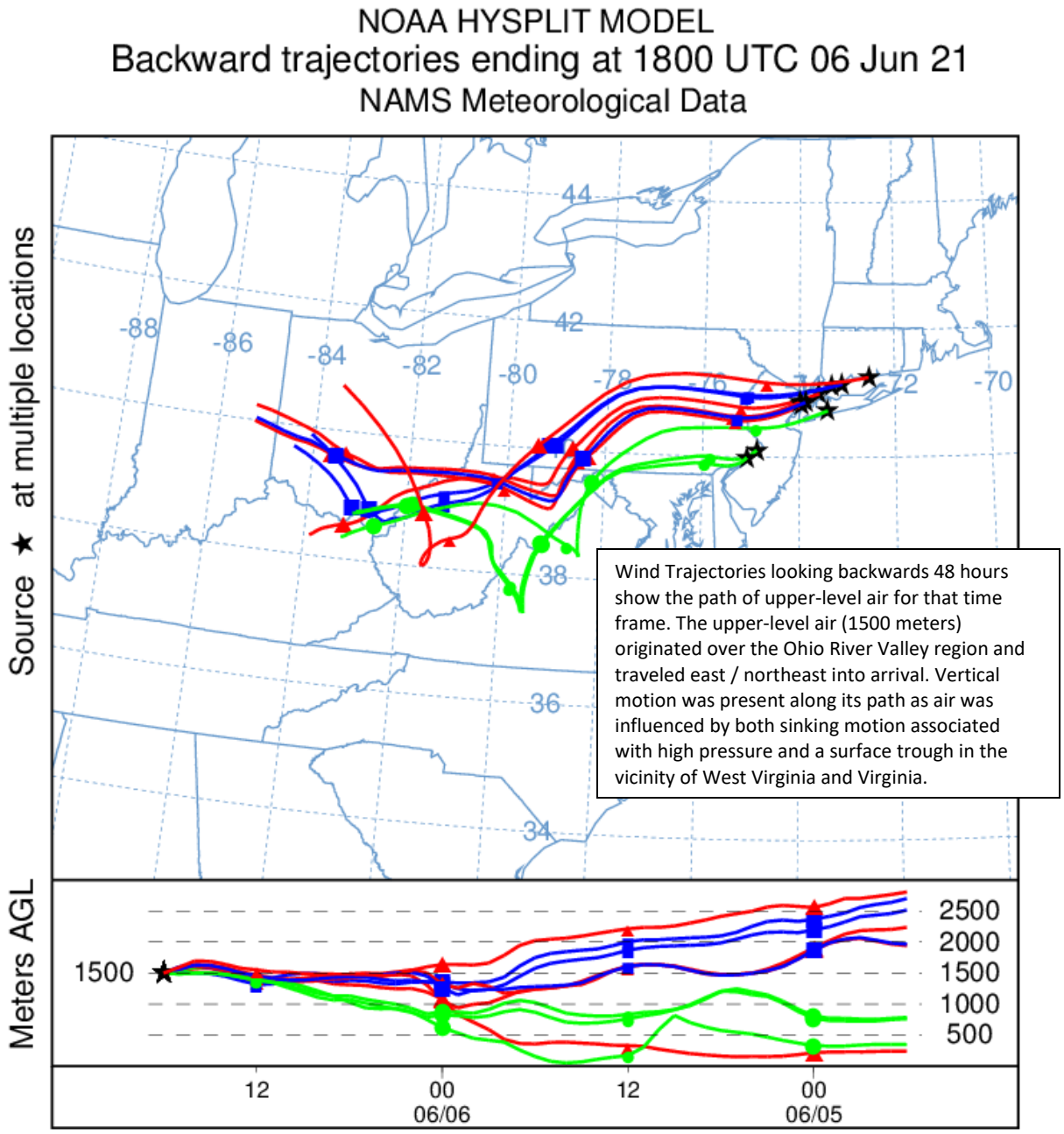
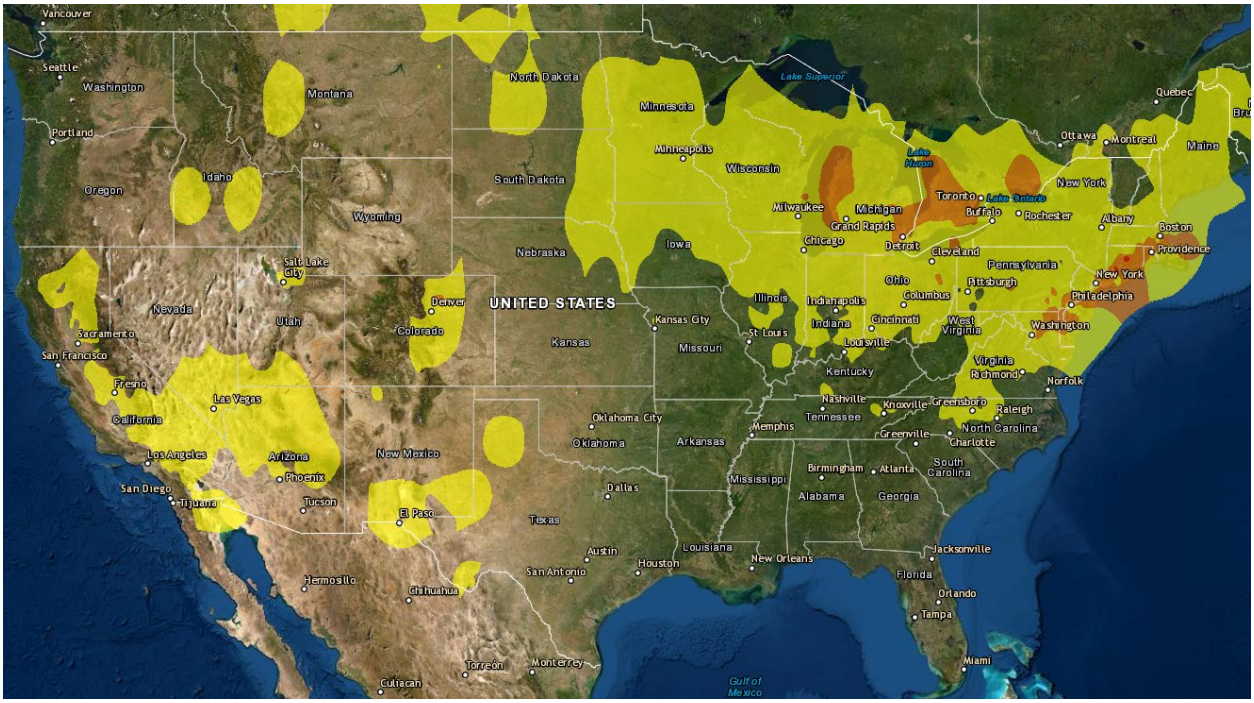


Figure 5. Combined Air Quality Index for the United States on June 5, 2021



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/ .