Ozone National Ambient Air Quality Standard Health Exceedances on August 3, 2020

Exceedance Locations and Levels

On Monday, August 3, 2020, 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 8/3/2020

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	44
Bayonne	47
Brigantine	35
Camden Spruce St	50
Chester	44
Clarksboro	49
Colliers Mills	51
Columbia	38
Flemington	44
Leonia	46
Millville	38
Monmouth University	44
Newark Firehouse	49
Ramapo	47
Rider University	57
Rutgers University	49
Washington Crossing*	53
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 non-attainment areas, there were two (2) exceedances 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 8/3/2020

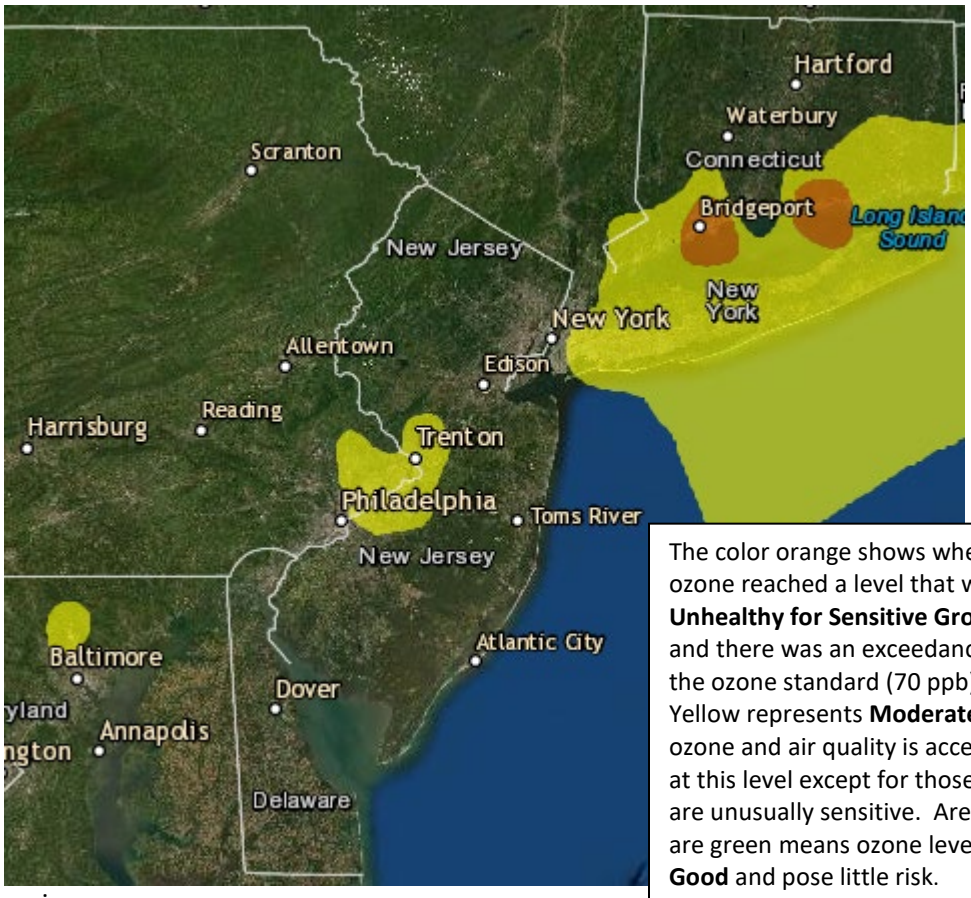
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	46
CT	Greenwich	64
CT	Madison-Beach Road	72
CT	Middletown-CVH-Shed	52
CT	New Haven	47
CT	Stratford	74
CT	Westport	70
DE	BCSP (New Castle Co.)	43
DE	BELLFNT2 (New Castle Co.)	46
DE	KILLENS (Kent Co.)	32
DE	LEWES (Sussex Co.)	35
DE	LUMS 2 (New Castle Co.)	42
DE	MLK (New Castle Co.)	47
DE	SEAFORD (Sussex Co.)	27
MD	Fair Hill	46
NY	Babylon	No Data
NY	Bronx - IS52	51
NY	CCNY	50
NY	Fresh Kills	49
NY	Holtsville	54
NY	Pfizer Lab	53
NY	Queens	58
NY	Riverhead	61
NY	Rockland Cty	45
NY	White Plains	53
PA	BRIS (Bucks Co.)	59
PA	CHES (Delaware Co.)	53
PA	NEWG (Chester Co.)	45
PA	NORR (Montgomery Co.)	53
PA	LAB (Philadelphia Co.)	53
PA	NEA (Philadelphia Co.)	58
PA	NEW (Philadelphia Co.)	57
	TOTAL EXCEEDANCES	2

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 – August 3, 2020 NAAQS = 70 ppb
Connecticut	12
Delaware	2
Maryland	0
New Jersey	4
New York	7
Pennsylvania	4

Figure 1. Ozone Air Quality Index for August 3, 2020



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

A frontal boundary was stalled over the non-attainment area on Monday August 3rd, 2020, while impacts of Tropical Storm Isaias, off the coast of Georgia/South Carolina, started to affect the Mid-Atlantic region throughout the day. These atmospheric conditions helped determine both sky cover and wind direction throughout the non-attainment area which in turn, limited ozone production in some locations while enhancing ozone levels in others, leading to two ozone exceedances along the Connecticut coastline.

A weak cold front approached the region from the west early in the day on August 3rd, before stalling over the non-attainment area mid-day. This front, associated with an area of low pressure over southern Quebec, extended south towards southern New England, through central New Jersey, and into the Mid-Atlantic region. The orientation of this front greatly affected the weather conditions in the non-attainment area. Locations east of this front saw a general mix of sun and clouds as well as winds backing west to south throughout the day. These conditions allowed for limited ozone production and the transport of a generally clean airmass into the area. Meanwhile, some locations east of the front, specifically points along the Connecticut coastline, saw abundant sunshine throughout the day, as well as, a strong southwesterly flow allowing for the transport of localized emissions from the NYC metropolitan area and the vicinity of Long Island Sound into a favorable environment for ozone production. Additionally, cloud cover associated with Tropical Storm Isaias may have also impacted ozone levels regionally. As clouds filled into the Mid-Atlantic region from south to north throughout the day, they helped to limit ozone production in southern portions of the non-attainment area while locations to the north saw more sunshine, which may have enhanced ozone production.

The ozone exceedances noted along the Connecticut coastline on August 3rd can be attributed to the transport of localized emissions from the NYC metropolitan area into a favorable weather environment for ozone formation.

Where Did the Air Pollution that Caused Ozone Come From?

Please note, this exceedance is 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 August 3, 2020. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Two 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	Stratford	74
CT	Madison-Beach Road	72

Back trajectories from August 3rd show that widespread moderate and isolated portions of USG in the Long Island Sound region were heavily influenced by localized transport of ozone precursors from the NYC metropolitan area to the Connecticut coastline. This localized transport in combination with the favorable meteorological conditions mentioned above allowed ozone concentrations to reach the USG category in Stratford, and Madison-Beach Road, CT.

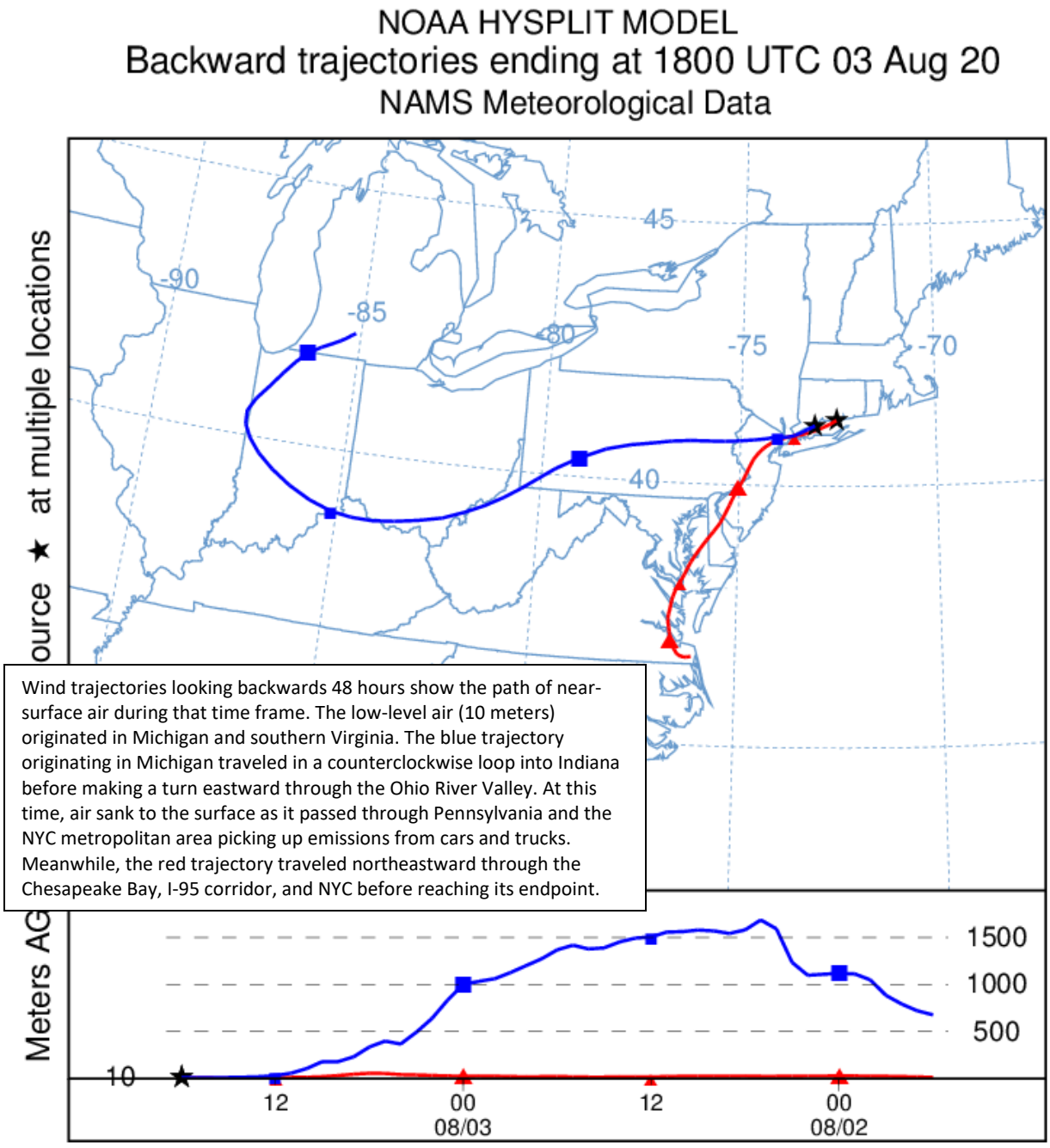
Surface level back trajectories (Figure 2) show that surface level air originated in two different locations and was transported at varying speeds along their paths. For our Madison-Beach Rd trajectory, the air parcel originated in far southeastern Virginia before traveling in a northeasterly direction through the Chesapeake Bay region. On the 2nd, the surface level air continued to travel in a northeasterly direction under the influence of light southwesterly winds at the surface. Air traversed slowly over the Philadelphia metropolitan area, up the I-95 corridor, and eventually into the NYC metropolitan area early on the 3rd, which allowed for a gradual buildup of localized pollutants from cars, trucks, industry and power generation along the way. Meanwhile, the surface-level trajectory from the Stratford monitor originated in southern Michigan and followed a counter-clockwise flow around low pressure situated over the Ohio River Valley. As high pressure began to strengthen over the region, surface winds shifted out of the west due to a passing cold front, causing the air to rapidly sink towards the surface as it traveled eastward through Pennsylvania. At this point, both trajectories converged and followed a similar path through the NYC metropolitan/Long Island Sound region.

In Figure 3, mid-level back trajectories (500 meters) originated in central Pennsylvania and eastern Michigan. Both trajectories rotated in a counterclockwise direction following a low-pressure system set up over the Great Lakes region. This allowed air parcels to pick up pollution from the heavily industrialized Ohio River Valley area. The trajectories then travelled in an easterly direction through Pennsylvania, and into the NYC metropolitan area, picking up ozone precursors along its path, before arriving at their destinations.

Figure 4 shows upper-level air (1500 meters) began over Louisiana and Arkansas before traveling northeastward through the Appalachian region. From there, air traveled over northern New Jersey and the NYC metropolitan area where it was able to pick up local pollutants before arriving in coastal Connecticut. The air was highly influenced by high pressure to the west of a stalled frontal boundary over the region, with a gentle sinking motion present in the trajectories.

Figure 5 shows the National Air Quality Index observed August 2nd, the day prior to this high ozone event. As shown in the figure, much of the region observed good air quality on this day. Despite a regionally clean air mass, the recirculation and transport of pollutants from the Ohio River Valley and the Southeast may have contributed to rising ozone concentrations along the Connecticut coastline. This transport in combination with favorable weather conditions mentioned above allowed ozone concentrations to reach the unhealthy for sensitive groups category in Connecticut.

Figure 2. 48-hour Back Trajectories for August 3, 2020 at 10 meters



Wind trajectories looking backwards 48 hours show the path of near-surface air during that time frame. The low-level air (10 meters) originated in Michigan and southern Virginia. The blue trajectory originating in Michigan traveled in a counterclockwise loop into Indiana before making a turn eastward through the Ohio River Valley. At this time, air sank to the surface as it passed through Pennsylvania and the NYC metropolitan area picking up emissions from cars and trucks. Meanwhile, the red trajectory traveled northeastward through the Chesapeake Bay, I-95 corridor, and NYC before reaching its endpoint.

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

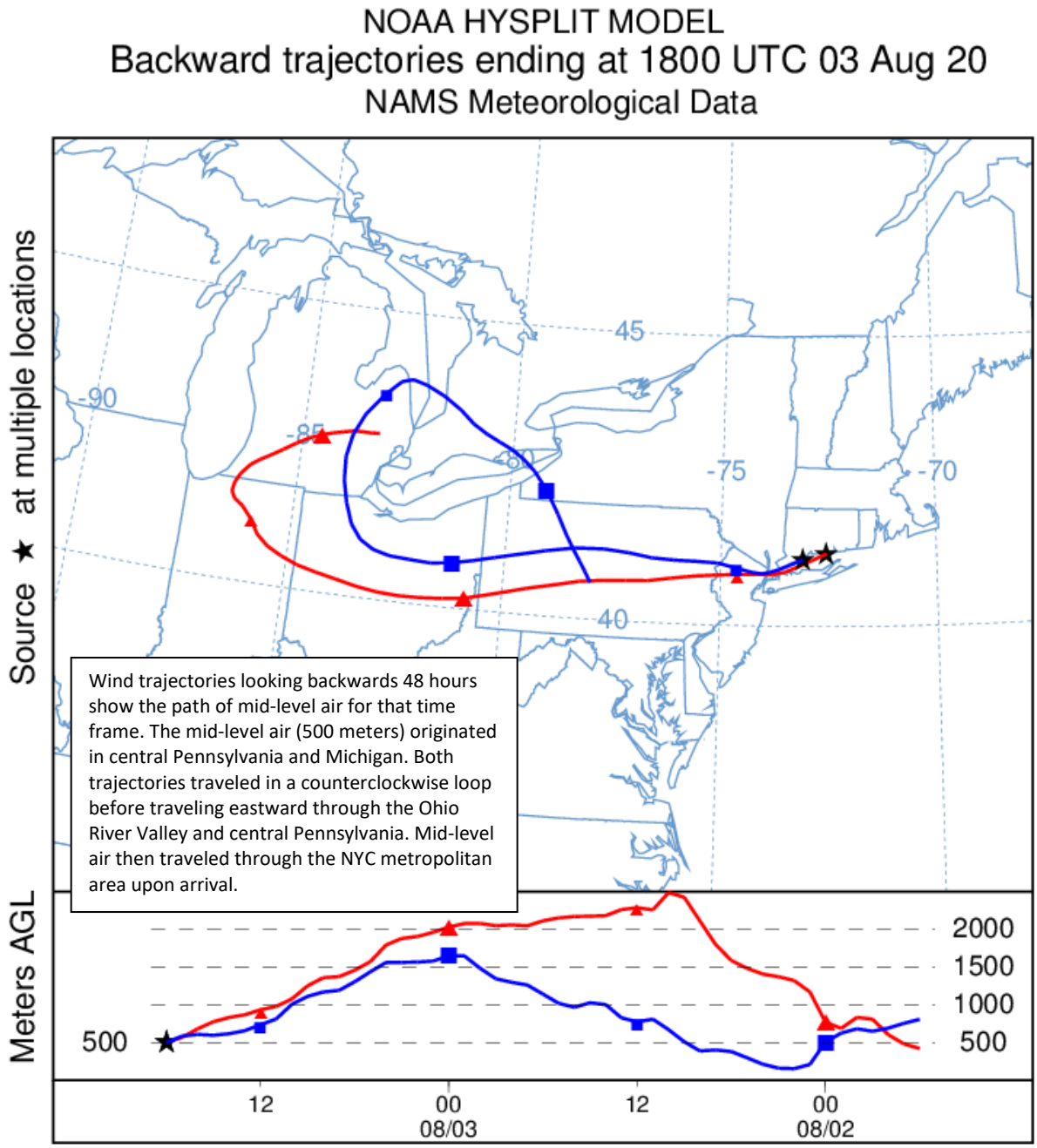
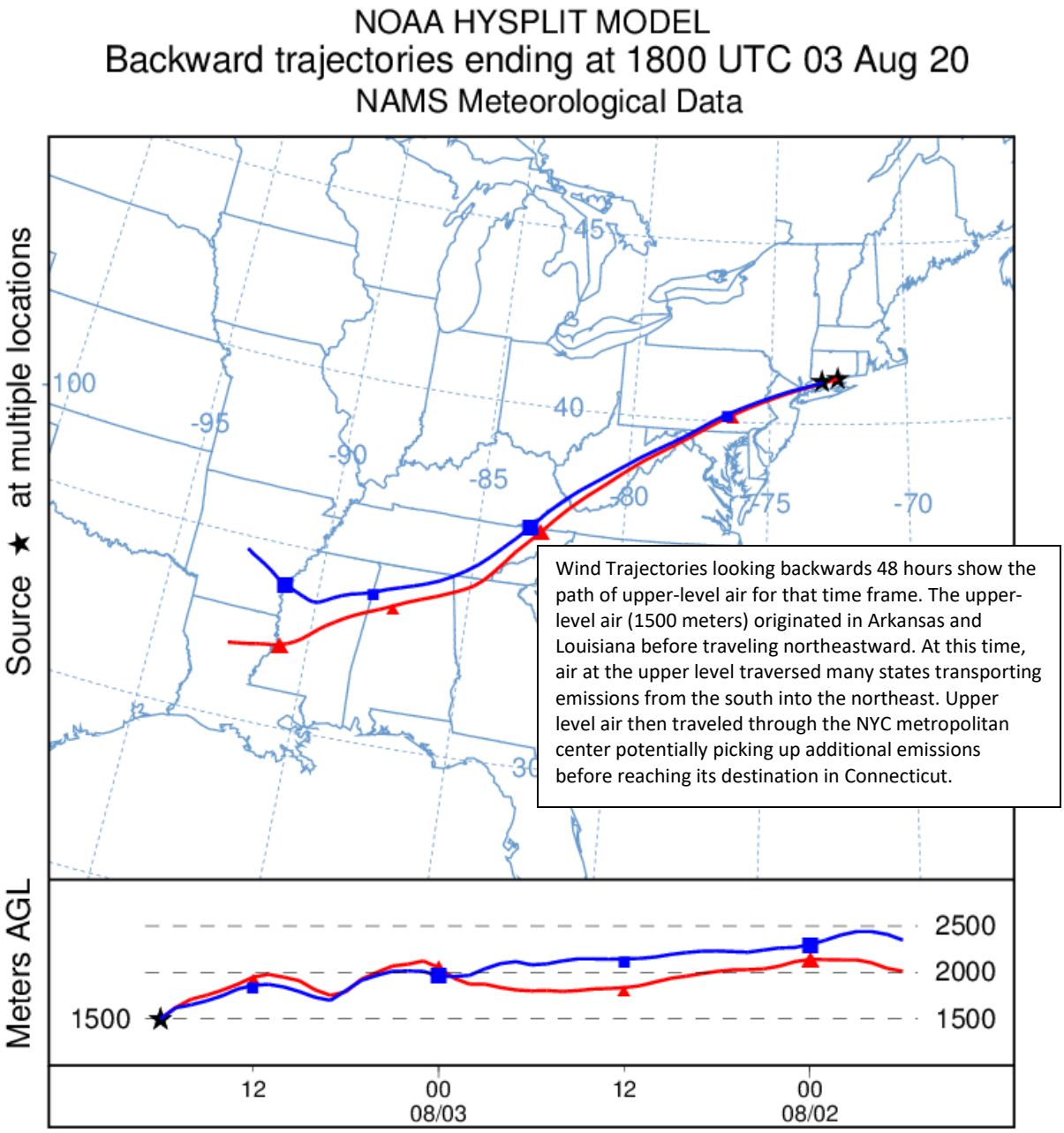
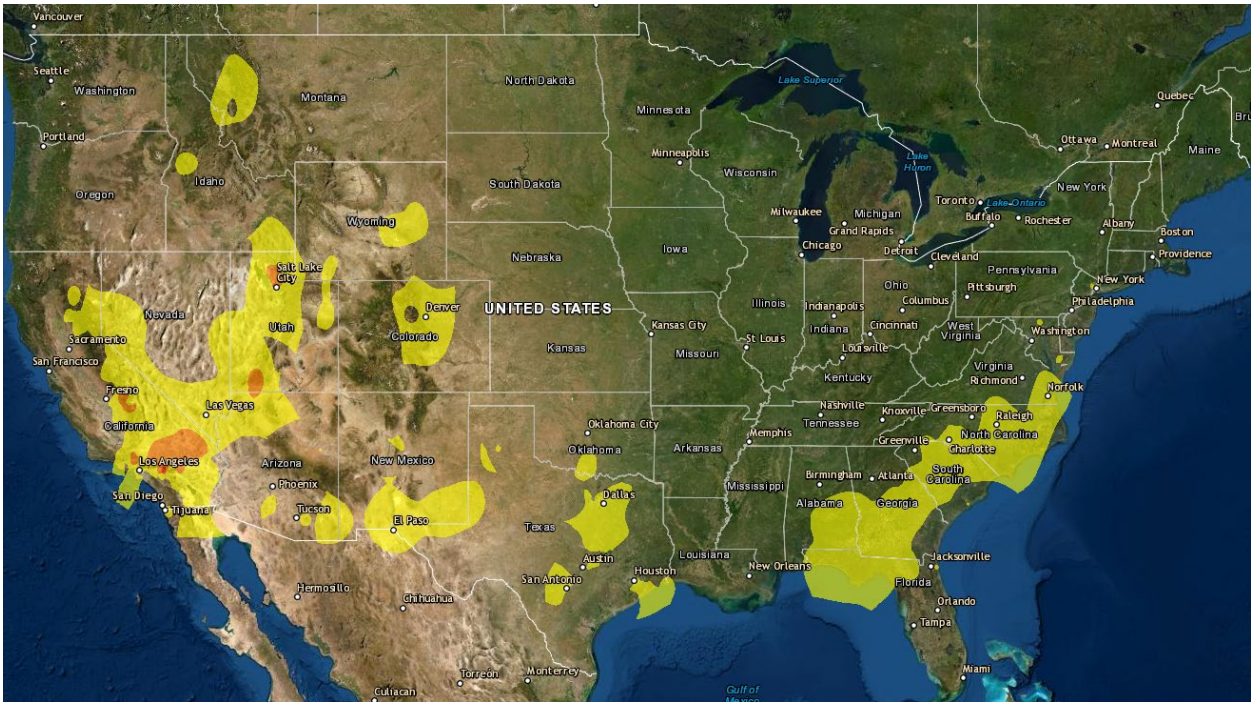


Figure 4. 48-hour Back Trajectories for August 3, 2020 at 1500 meters



Wind Trajectories looking backwards 48 hours show the path of upper-level air for that time frame. The upper-level air (1500 meters) originated in Arkansas and Louisiana before traveling northeastward. At this time, air at the upper level traversed many states transporting emissions from the south into the northeast. Upper level air then traveled through the NYC metropolitan center potentially picking up additional emissions before reaching its destination in Connecticut.

Figure 5. Combined Air Quality Index for the United States on August 2, 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/ .