Ozone National Ambient Air Quality Standard Health Exceedances on May 21, 2021

Exceedance Locations and Levels

On Friday, May 21, 2021, there were two (2) 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 5/21/2021

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	52
Bayonne	34
Brigantine	40
Camden Spruce St	57
Chester	66
Clarksboro	56
Colliers Mills	56
Columbia	69
Flemington	66
Leonia	46
Millville	49
Monmouth University	40
Newark Firehouse	No Data
Ramapo	62
Rider University	77
Rutgers University	79
Washington Crossing*	66
TOTAL EXCEEDANCES	2

*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 no 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 5/21/2021

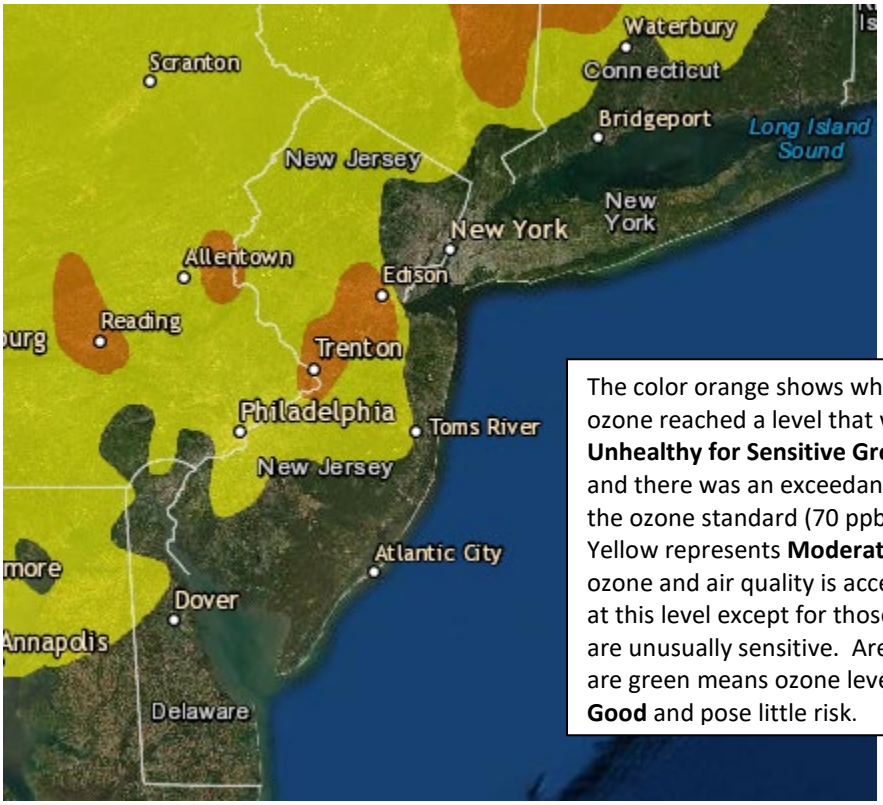
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	64
CT	Greenwich	49
CT	Madison-Beach Road	43
CT	Middletown-CVH-Shed	58
CT	New Haven	44
CT	Stratford	47
CT	Westport	49
DE	BCSP (New Castle Co.)	56
DE	BELLFNT2 (New Castle Co.)	50
DE	KILLENS (Kent Co.)	50
DE	LEWES (Sussex Co.)	42
DE	LUMS 2 (New Castle Co.)	53
DE	MLK (New Castle Co.)	53
DE	SEAFORD (Sussex Co.)	50
MD	Fair Hill	57
NY	Babylon	42
NY	Bronx - IS52	41
NY	CCNY	No Data
NY	Fresh Kills	47
NY	Holtsville	39
NY	Pfizer Lab	43
NY	Queens	44
NY	Riverhead	41
NY	Rockland Cty	65
NY	White Plains	48
PA	BRIS (Bucks Co.)	70
PA	CHES (Delaware Co.)	53
PA	NEWG (Chester Co.)	51
PA	NORR (Montgomery Co.)	61
PA	LAB (Philadelphia Co.)	57
PA	NEA (Philadelphia Co.)	67
PA	NEW (Philadelphia Co.)	68
	TOTAL EXCEEDANCES	0

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 – May 21, 2021 NAAQS = 70 ppb
Connecticut	0
Delaware	1
Maryland	1
New Jersey	2
New York	0
Pennsylvania	1

Figure 1. Ozone Air Quality Index for May 21, 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 established itself over the eastern half of the United States on Friday, May 21st, as a weakening cold front, which influenced the region the day prior, quickly weakened west of New Jersey. Generally favorable meteorological conditions as well as the transport of local/regional emissions and residual ozone aloft allowed for elevated levels of ozone at the surface throughout portions of the western nonattainment area, with two exceedances noted in central New Jersey.

High pressure ridging over the Canadian Maritimes extended southwest early Friday and quickly broadened, covering much of the eastern United States throughout the day. A high pressure center established itself over the Mid-Atlantic region allowing for favorable weather conditions for ozone formation, such as mostly sunny skies and warm temperatures, to be observed across the nonattainment area. On this day, locations with a southerly wind closer to the ocean saw cleaner air quality compared to locations further inland. It is likely that the exceedances in central New Jersey were influenced by the transport of localized emissions from cars, trucks, and industry into an environment favorable for ozone formation. Furthermore, with high pressure centered so close to the nonattainment area, the associated sinking motion would have also allowed for any residual ozone from days prior to be brought down toward the surface, enhancing ozone levels at these monitors.

The two ozone exceedances in central New Jersey can be attributed to favorable weather conditions for ozone formation and the localized/regional transport of emissions and residual ozone, at the surface and aloft.

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 May 21, 2021. 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 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)
NJ	Rider University	77
NJ	Rutgers University	79

Back trajectories from May 21st show that the exceedances observed in central New Jersey were influenced by building high pressure, allowing for both localized transport of emissions at the surface as well as more regional transport of elevated levels of ozone, especially in the upper-levels of the atmosphere.

The surface-level back trajectories (Figure 2) show that air impacting the two central New Jersey monitors originated over the western Atlantic Ocean, south of Cape Cod, MA. Air then traveled generally west toward the New Jersey coastline throughout the day on May 20th, as it was steered by building high

pressure. Air then turned more northwesterly in the overnight hours before finally turning almost due north through arrival. Air significantly slowed once it reached land and remained at the surface for the duration of its path, allowing for any localized transport of emissions from cars, trucks, and industry.

Meanwhile, the mid-level back trajectories (Figure 3) show that air originated over New Brunswick, Canada in the upper levels of the atmosphere. Air, influenced by high pressure, then traveled south and southwest over the Atlantic Ocean toward the New Jersey coastline through late May 20th, sinking in the atmosphere during this time. Air then gradually turned northwest to northeast over the Philadelphia metropolitan area and traveled up the I-95 corridor to its destination.

Finally, upper-level back trajectories (Figure 4) show that air impacting the two central New Jersey monitors took similar paths but originated in different locations and heights of the atmosphere and traveled at different speeds. Air impacting the Rider University monitor originated over Quebec in the upper atmosphere. Air then quickly traveled generally south on May 20th, through portions of Vermont, Massachusetts, and New York, gradually sinking under the influence of high pressure. Air then slowed significantly on May 21st as it recirculated over eastern Pennsylvania into arrival. It is worth noting that this portion of Pennsylvania saw varying elevated levels of ozone the day prior. Meanwhile, air impacting the Rutgers University monitor originated over northern portions of New York State and then slowly traveled south-southwest through the Hudson Valley and into northern New Jersey. Similar to the other trajectory, air then recirculated over eastern Pennsylvania before reaching its destination. Overall, both upper-level trajectories show that air traveled through locations that experienced elevated levels of ozone the day prior. Under the influence of sinking motion associated with high pressure, it's possible these elevated levels of ozone were then brought toward the surface, enhancing levels to the point of exceedance.

Figure 5 shows the National Air Quality Index observed on May 20th, the day prior to this exceedance event. As shown in the figure, widespread moderate and isolated areas of unhealthy for sensitive groups (USG) ozone levels were observed over interior portions of the northeastern United States and west toward the Ohio River Valley and Great Lakes region. The localized and regional transport of elevated ozone levels, especially in the upper levels of the atmosphere, in combination with the favorable meteorological conditions mentioned previously, led to the two ozone exceedances in central New Jersey.

Figure 2. 48-hour Back Trajectories for May 21, 2021 at 10 meters

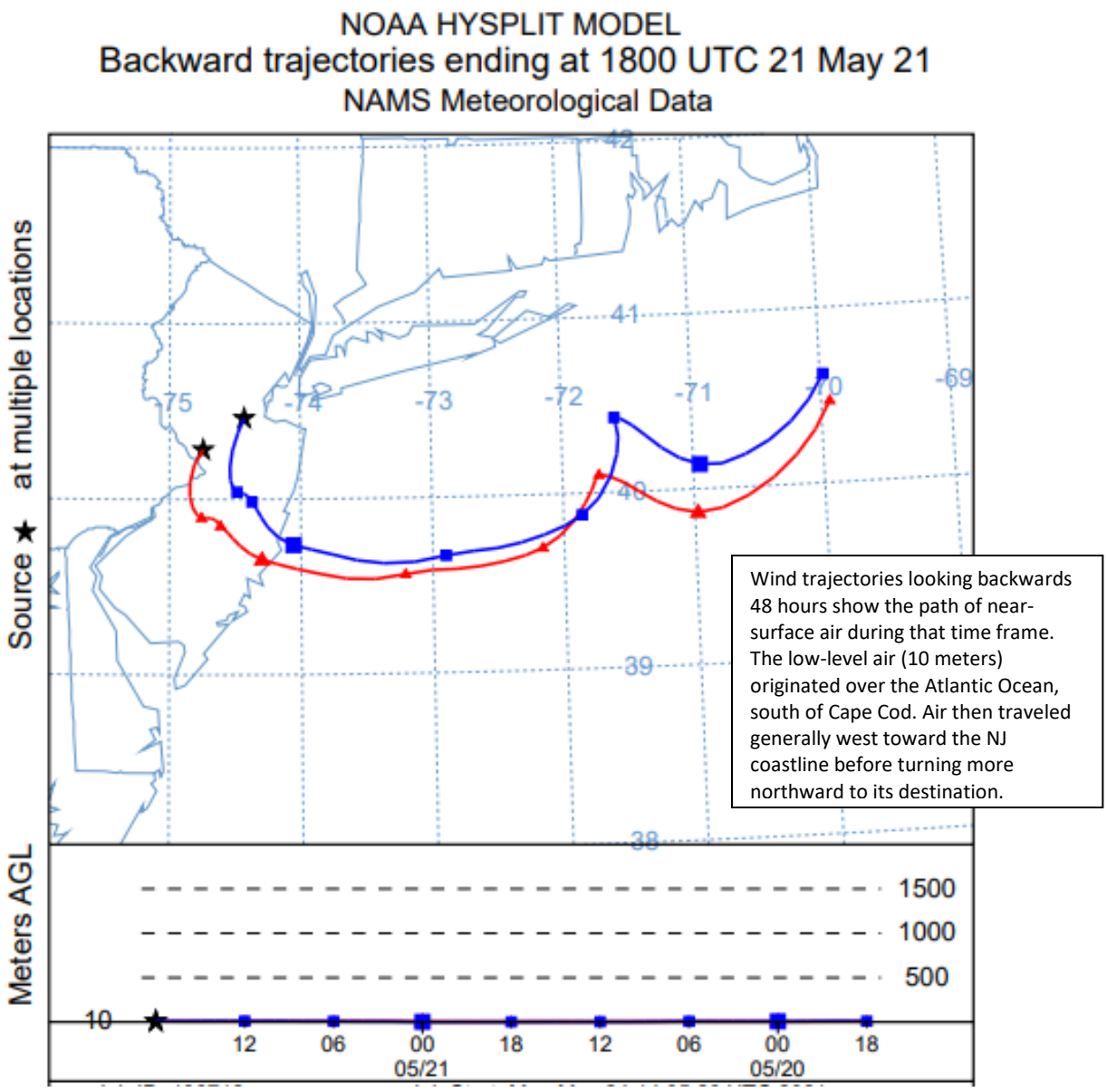


Figure 3. 48-hour Back Trajectories for May 21, 2021 at 500 meters

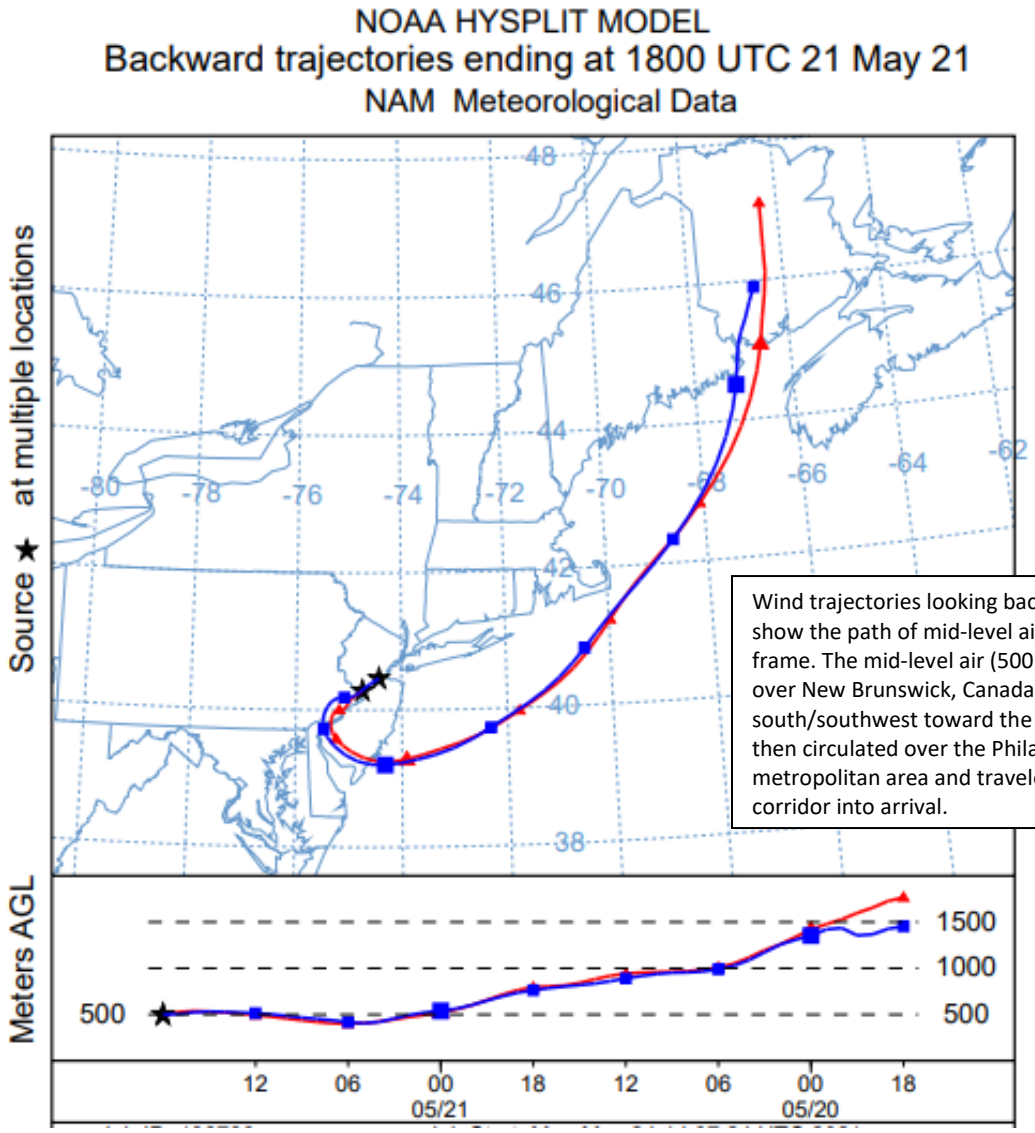


Figure 4. 48-hour Back Trajectories for May 21, 2021 at 1500 meters

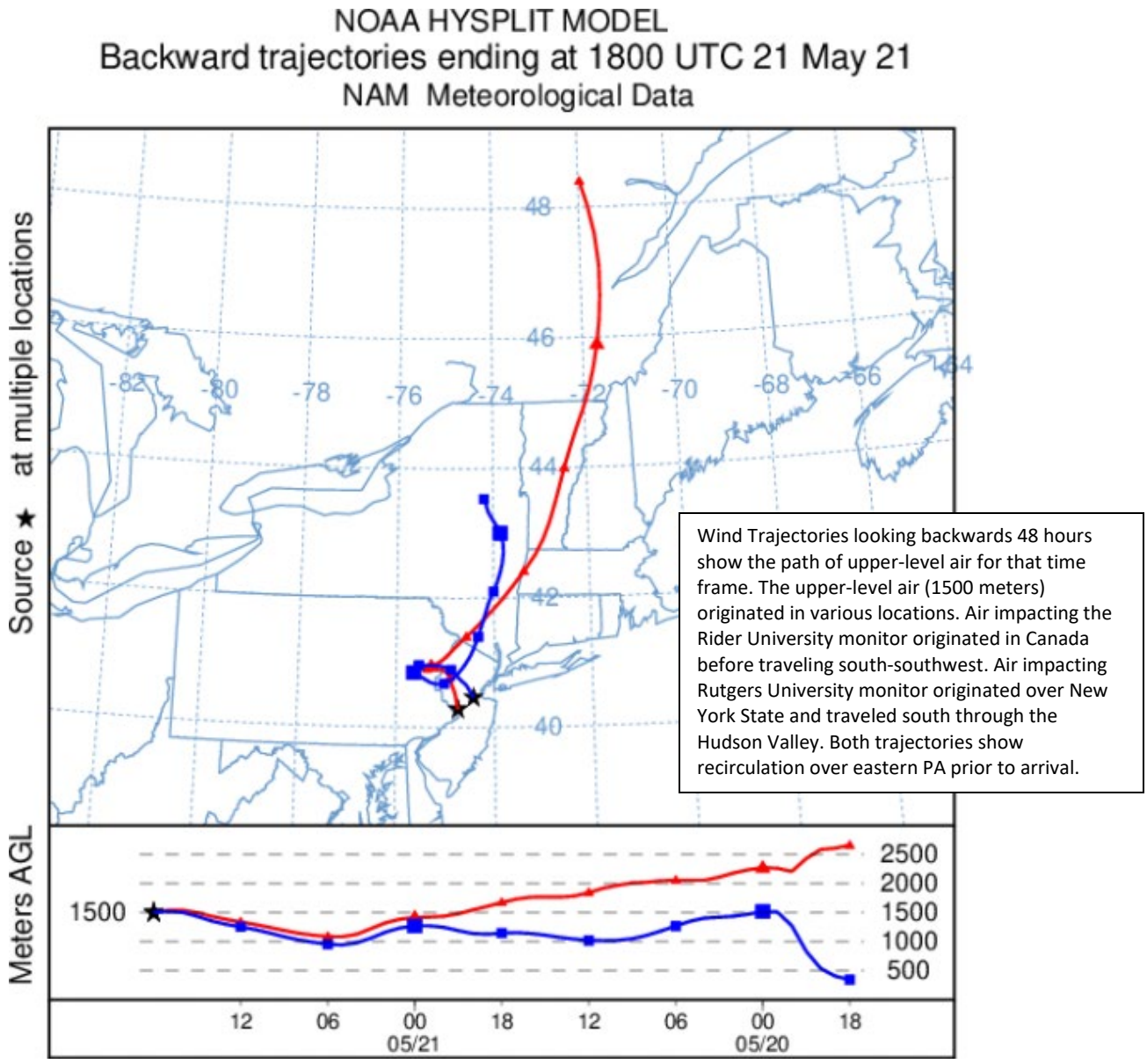
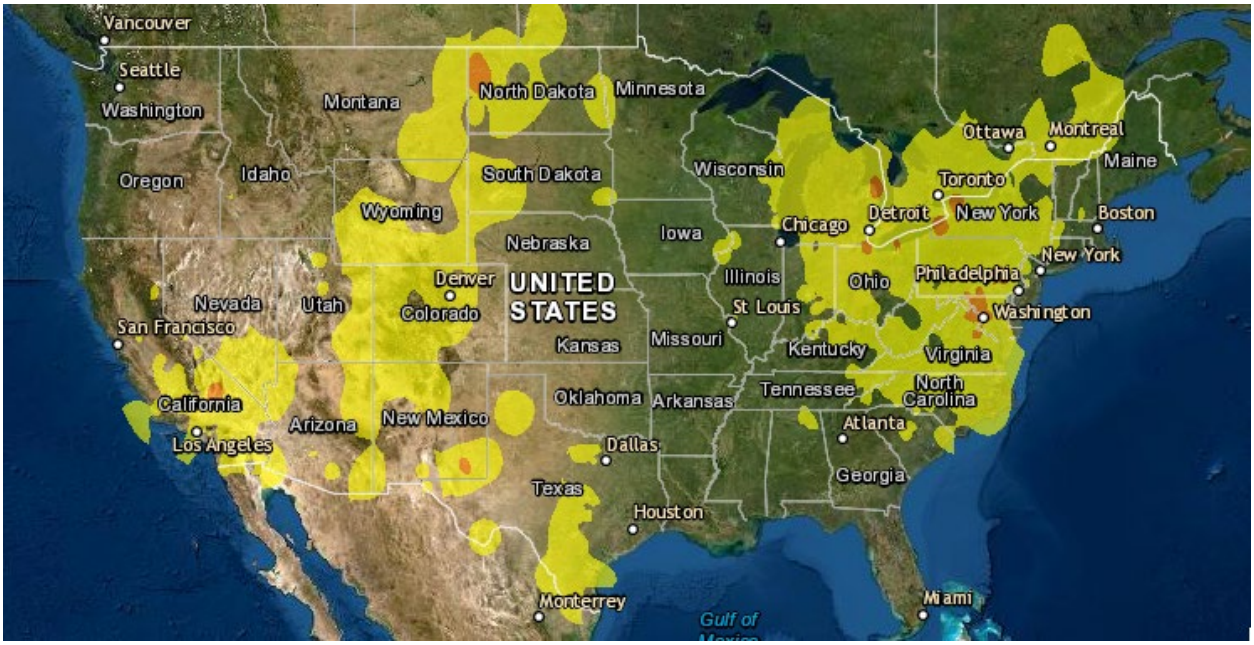


Figure 5. Combined Air Quality Index for the United States on May 20, 2021



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/ .