



Seasonal Report

2024 Fine Particles (PM_{2.5})

OVERVIEW

Fine Particle pollution, or **PM_{2.5}**, is one of six **criteria pollutants** to have National Ambient Air Quality Standards (**NAAQS**) set by the Environmental Protection Agency (**EPA**). PM_{2.5} comes from many different sources including vehicle exhaust, power plants, industrial activity, sea salt, wildfires, and can form through chemical reactions in the atmosphere. Since 2005, there has been a downward trend in fine particle pollution in Maryland; 2024 was generally a continuation of this trend.

Due to its small size (**Figure 1**), PM_{2.5} can travel deep into the respiratory tract, reaching the lungs and causing adverse health effects. Scientific studies have found associations between PM_{2.5} exposure and a variety of health problems, including heart and kidney diseases, diabetes, hypertension, lung cancer, pneumonia, and aggravated asthma. (See [EPA](#) and [CDC](#) sites for more on PM_{2.5} and health)

When daily average PM_{2.5} concentrations exceed 35.4 micrograms per cubic meter (**µg/m³**), the equivalent of 100 on the Air Quality Index, (**AQI**) (see color bar on bottom of page) air quality is deemed **Unhealthy for Sensitive Groups (USG)** and is otherwise known as an “**exceedance day**”. Maryland has seen a steady decrease in the number of PM_{2.5} exceedance days over the past 15+ years (**Figure 2**), due largely to the adoption of regulations to reduce emissions.

HIGHLIGHTS & STATS

Based on maximum daily PM_{2.5} concentrations, Maryland had 193 “**Good**” AQI days in 2024, accounting for over 50% of the year (**Figure 3**); this generally follows the trend of **Good** days over the past 10+ years. In comparison with seasonal reports from previous years, total **Good** days for 2024 were counted using a new threshold. When EPA announced the lowering of the annual PM_{2.5} standard from an average of 12 to 9 µg/m³, the threshold for Good days changed to 9 µg/m³ as well. **Figure 3** shows the change in the number of **Good** days since 2005, from the old standard in blue, to the new standard in green. Considering the

increasing trend of good days, and the number of PM_{2.5} exceedance days in Maryland generally decreasing, a good alternative is to look at the number of “**haze days**”. A haze day is defined as when the PM_{2.5} daily maximum concentration exceeds 25 µg/m³ (81 AQI). On these

days, the air can be perceptibly hazy. As seen in **Figure 4**, above right, Maryland had just four days that fit this criterion in 2024, a sizeable decrease from 2023, when wildfire smoke brought more haze to the region. A visual comparison of a **Good** day with clear visibility vs. an **Unhealthy** day with visible haze due to smoke, can be seen below in **Figures 5 & 6**.

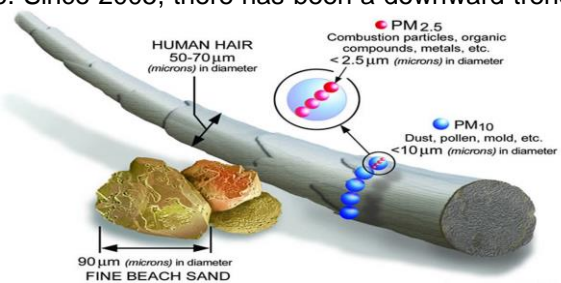


Figure 1: PM size comparison. (Image courtesy of [EPA](#))

Maryland PM_{2.5} Exceedance Days

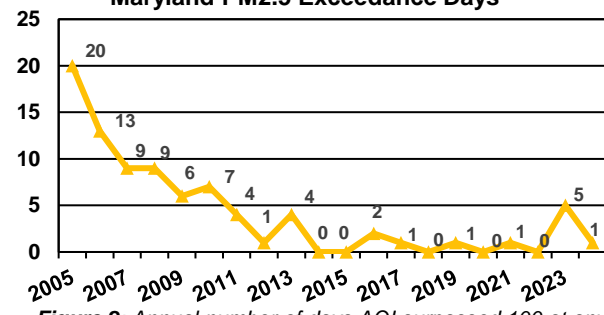


Figure 2: Annual number of days AQI surpassed 100 at any PM_{2.5} monitor in Maryland, 2005-2024.

Maryland “Good Days”, AQI ≤50

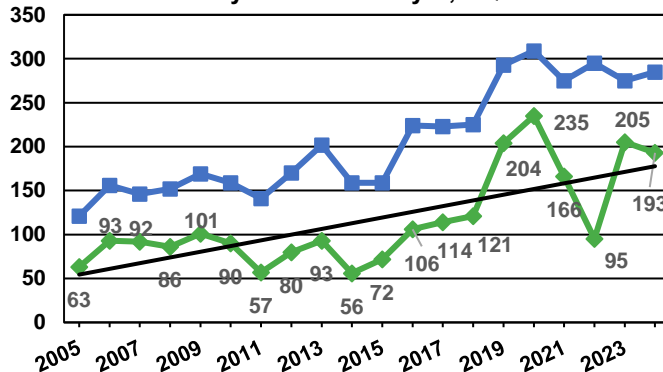


Figure 3: Annual number of days the highest PM_{2.5} monitor remained at or below an AQI of 50, or “Good”, in Maryland. 2012 standard, 2024 standard; black trend line included.

Maryland “Haze Days” above 25 µg/m³

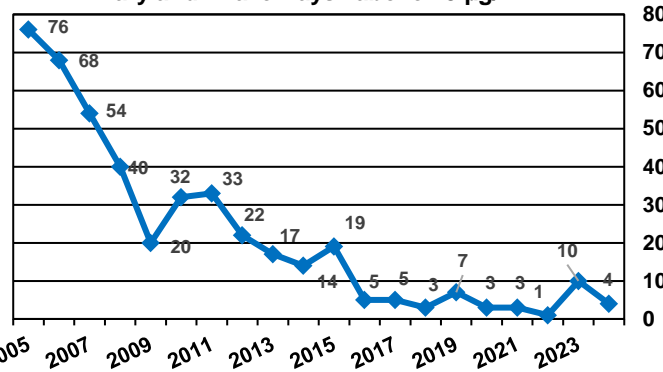


Figure 4: Annual number of days PM_{2.5} concentrations reached 25 µg/m³ or greater at any monitor in Maryland, 2005-2024.



Figures 5 & 6: AQI and visibility demonstrated using drone photos taken over Northeast Baltimore. Left, a **Good** Daily AQI of 44 on October 24, 2023 vs. right, an **Unhealthy** Daily AQI of 179, as measured at MDE’s nearby Lake Montebello monitoring site on June 29, 2023 during a wildfire event (see 2023 PM Annual Report).

AQI 0-50 Good	51-100 Moderate	101-150 USG*	151-200 Unhealthy	201-300 Very Unhealthy	301-500 Hazardous
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*USG: Unhealthy for Sensitive Groups

MARYLAND DEPARTMENT OF THE ENVIRONMENT

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Wes Moore, Governor | Aruna Miller, Lt. Governor | Serena McIlwain, Secretary





Seasonal Report

2024 Fine Particles (PM_{2.5})

FEATURED EPISODE: November 3rd, 2024

PM_{2.5} exceedances were more numerous in Maryland 20+ years ago (see **Figure 2**), but they have decreased in frequency in recent years due to regulation and reductions in atmospheric pollutants such as sulfur dioxide and nitrogen oxides. Elevated PM_{2.5} concentrations seen in recent years are largely driven by two factors: meteorological impacts, specifically cases of temperature inversions (See **2017 PM Annual Report**), mostly seen in winter, and wildfires, which can occur year-round, but are more common in warmer months. As climate conditions have become hotter and drier, wildfires have become more intense, and smoke from these fires can cause exceedances and/or poor air quality in Maryland.

Smoke is often transported into our region from agricultural and other prescribed burns and wildfires from Southern and Midwestern states, the Prairie provinces of Canada, or even as far as California. In 2024, the highest maximum 24-hour PM_{2.5} average of 40 µg/m³ was measured on November 3rd at the Maryland Department of the Environment's (MDE) Edgewood monitoring site (**Figure 7, right**). This was the only PM_{2.5} exceedance of 2024, when the Air Quality Index reached 112, falling in the **USG*** range. This year, the highest maximum concentration was related to range fires occurring on the U.S. Army's Aberdeen Proving Ground (APG) installation from about November 2nd – 8th. Satellite data obtained from the National Aeronautics and Space Administration's (NASA) Moderate Resolution Imaging Spectroradiometer (**MODIS**, aboard Aqua), and the National Oceanic and Atmospheric Administration's (NOAA) Visible Infrared Imaging Radiometer Suite (**VIIRS**, aboard NOAA-20), indicated the presence of active fires on APG in the early morning hours of November 3rd, and again with an increased intensity later that afternoon (**Figure 8, below left**).

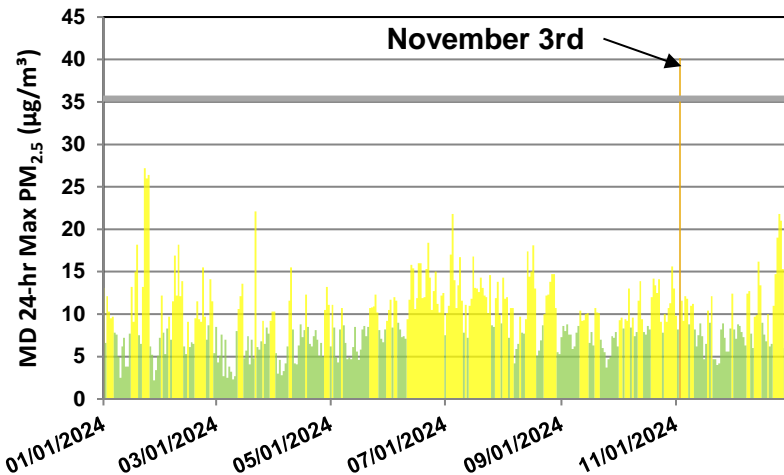


Figure 7: Maximum daily 24-hour PM_{2.5} (µg/m³) concentrations in Maryland from January 1 – December 31, 2024. Bars are color coded by AQI. Exceedance day level threshold is noted by the thicker grey line. The 2024 daily maximum PM_{2.5} concentration of 40 µg/m³ on November 3rd is indicated.

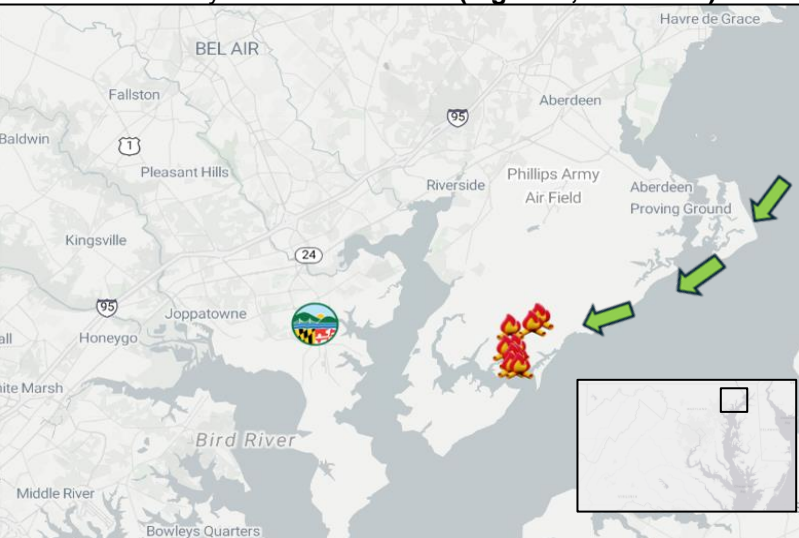


Figure 8: Map of the vicinity of MDE's Edgewood monitor, marked with a green circle; wind direction marked by green arrows; red fire icons mark location of fires detected by the MODIS and VIIRS satellite instruments; inset indicates detailed area in map.



Figure 9: The Maryland Army National Guard provided aerial firefighting support to combat fires at Aberdeen Proving Ground. (Image courtesy **Maryland Nat'l Guard**)

Range fires are common occurrences at APG, that often go unnoticed by the public and are extinguished without problem by the installation's Fire and Emergency Services. When range fires broke out on November 2nd - 3rd, drought conditions occurring during fall foliage change, in vegetation naturally apt to create copious smoke, with easterly winds blowing smoke inland, made the fires and their smoke more noticeable to the public. Due to operational safety concerns for firefighters on the ground, aerial support was requested but was condition dependent and was not available at all times during the fires. When strong northeasterly winds pushed through the region Sunday afternoon, diffuse smoke moving towards Edgewood on November 3rd prompted many local residents to contact emergency services. A Code Orange alert was issued the evening of November 3rd for parts of Baltimore and Harford counties, lasting until noon the next day, as meteorological conditions kept smoke in the area. Members of the Maryland Army National Guard would eventually perform 219 water drops over the next several days to control and extinguish the fires (**Figure 9, above right**). To learn more about air quality in your area, please visit MDE's Air Monitoring page, and sign up for air quality alerts at enviroflash.info.

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