United States Environmental Protection Agency

PROPOSED REVISIONS TO NATIONAL AMBIENT AIR QUALITY STANDARDS FOR PARTICULATE MATTER

January 2023

Key Messages

- On January 5, 2023, EPA proposed to strengthen the National Ambient Air Quality Standards for Particulate Matter ("PM NAAQS") to protect millions of Americans from harmful and costly health impacts, such as heart attacks and premature death.
- This proposal reflects EPA's reconsideration of the December 2020 decision to retain the PM NAAQS on the basis that the available scientific and technical information indicates that the existing standards may not provide adequate protection.
- This proposal reflects extensive review of the scientific record and input from the public and EPA's Clean Air Scientific Advisory Committee.
- The proposed rule will advance environmental justice by leading to reductions in particle pollution, which disproportionately burdens communities of color and other vulnerable communities.
- On-the-books regulations and available control measures can reduce particle pollution in highly cost-effective manner, leading to large net public health benefits ($17-$43B in 2032).
- Implementing these standards is a federal, state, and tribal partnership. EPA will continue to do our part to assist states and tribes with implementation.
- For more information on particle pollution and to read the proposed action, visit https://www.epa.gov/pm-pollution.

Main Elements of the Proposal

- EPA is proposing to **revise the level of the primary (health-based) annual standard** for fine particles ($PM_{2.5}$) from its current level of 12 µg/m^3 to within the range of 9 – 10 µg/m^3.
  - EPA is soliciting comment on revising the level as low as 8.0 µg/m^3 and up to 11.0 µg/m^3.
- EPA is proposing to **retain all other PM standards**:
  - Proposing to retain the primary (health-based) and secondary (welfare-based) 24-hour $PM_{2.5}$ standards at the level of 35 µg/m^3, while soliciting comment on revising the level as low as 25 µg/m^3.
  - Proposing to retain the primary and secondary 24-hour PM_{10} standards.
  - Proposing to retain the secondary annual $PM_{2.5}$ standard at the level of 15 µg/m^3.
- EPA is also proposing to:
  - Revise the Air Quality Index (AQI) to improve public communications about the risks from $PM_{2.5}$ exposures.
  - Make changes to the monitoring network to enhance protection of air quality in communities overburdened by air pollution.

Summary of Current Standards and Proposed Revisions

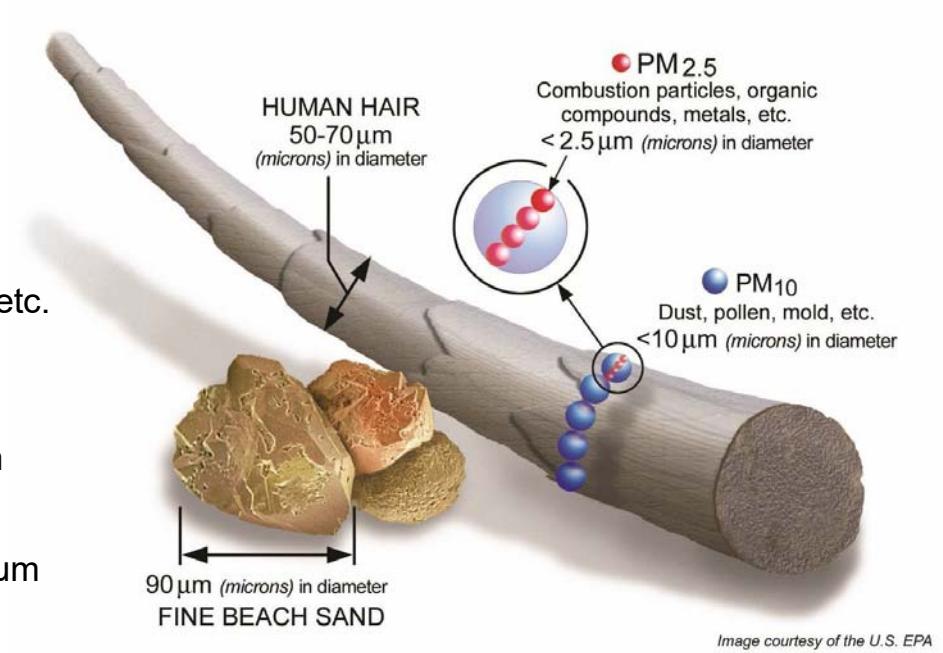
Current Standards – Last Revised in the 2012 Review*					Decisions in 2012 Review	Decisions in 2020 Review	Proposed Decisions in 2022 Reconsideration
Indicator	Averaging Time	Primary/ Secondary	Level	Form			
$PM_{2.5}$	Annual	Primary	12.0 µg/m³	Annual arithmetic mean, averaged over 3 years	Revised level from 15 to 12 µg/m³**	Retained	Revise level to 9-10 µg/m³ (Comment on 8-11 µg/m³)
		Secondary	15.0 µg/m³		Retained**	Retained	Retain
	24-hour	Primary and Secondary	35 µg/m³	98th percentile, averaged over 3 years	Retained	Retained	Retain (Comment on revising as low as 25 µg/m³)
PM_{10}	24-hour	Primary and Secondary	150 µg/m³	Not to be exceeded more than once per year on average over a 3-year period	Retained	Retained	Retain

* Prior to 2012, PM NAAQS were reviewed and revised several times – established in 1971 (total suspended particulate – TSP) and revised in 1987 (set PM_{10}), 1997 (set $PM_{2.5}$), 2006 (revised $PM_{2.5}$, PM_{10})

** EPA eliminated spatial averaging for the annual standards

What is Particulate Matter (PM)?

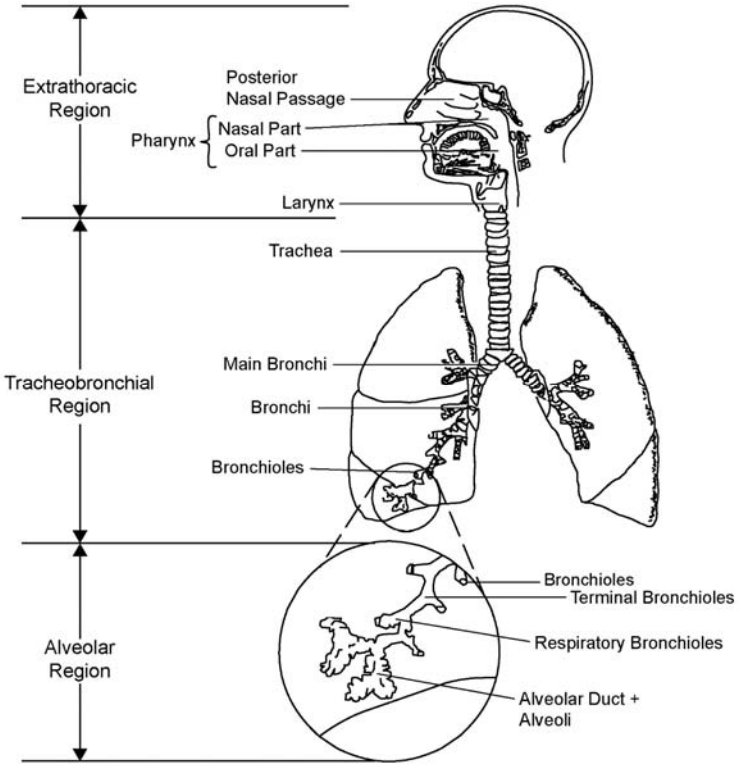
- Mixture of solid and liquid droplets
  - Primary particles emitted directly from a source (e.g., smokestacks, fires, construction sites)
  - Secondary particles produced through complex atmospheric reactions of chemicals (e.g., NO_2, SO_2) emitted by sources such as power plants, automobiles, etc.
- Particles defined by aerodynamic diameter
  - Coarse particles (PM_{10}), aerodynamic diameter ≤ 10 µm
  - Fine particles ($PM_{2.5}$), aerodynamic diameter ≤ 2.5 µm
  - Ultrafine particles (UFPs), aerodynamic diameter ≤ 0.1 µm



Source: https://www.epa.gov/pm-pollution

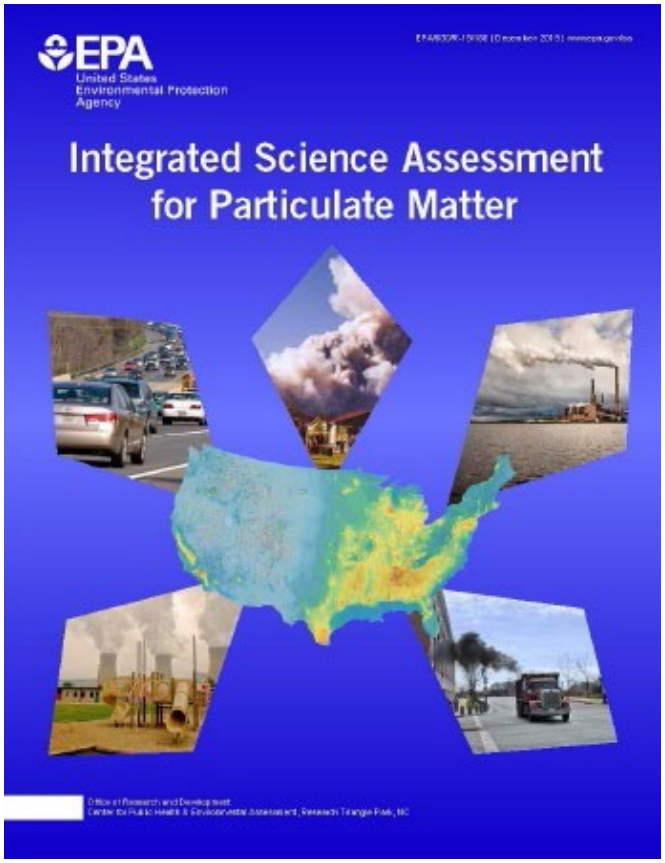
Why is PM a Public Health Concern?

- Fine particles ($PM_{2.5}$) are of greatest health concern
- $PM_{2.5}$ can enter the respiratory tract and make their way into the lower parts of the lungs
- Some particles can move out of the respiratory system and affect other organ systems
- Exposure to $PM_{2.5}$ can both exacerbate pre-existing health conditions and lead to the development of some diseases (e.g., respiratory and cardiovascular) as well as premature mortality



Health Effects and At-Risk Populations

- 2019 Integrated Science Assessment (ISA) and ISA Supplement include a large body of newly available scientific evidence that links exposure to $PM_{2.5}$ to a wide array of adverse health effects
- 2019 ISA finds exposure to $PM_{2.5}$ causes mortality and cardiovascular effects and is likely to cause respiratory effects, cancer, and nervous system effects
- The NAAQS are intended to protect both the population as a whole and those potentially at increased risk for health effects following exposure to PM
- At-risk populations include children, older adults, people with pre-existing respiratory or cardiovascular disease, minority populations, and low socioeconomic status (SES) populations



https://www.epa.gov/isa/integrated-science-assessment-isa-particulate-matter

Proposed Revisions to the Primary Annual $PM_{2.5}$ Standard

- In this proposal, EPA concludes that the available scientific information calls into question the adequacy of the public health protection afforded by the current primary annual $PM_{2.5}$ standard and that it is appropriate to consider strengthening this standard:
  - Recent studies suggest adverse health effects from exposure to $PM_{2.5}$ are occurring at concentrations allowed by the current standards, with additional studies demonstrating improvements in public health, including reductions in mortality, following reductions in $PM_{2.5}$ in areas with air quality below current standards
  - EPA's quantitative risk assessment estimates that the current primary standards could allow thousands of $PM_{2.5}$-associated deaths per year
- The Clean Air Act requires primary standards to be "requisite to protect public health with an adequate margin of safety," including the health of groups of people considered more at risk
- Clean Air Scientific Advisory Committee (CASAC) provided consensus advice on need to revise annual standard, but varying levels were recommended (majority of members recommended 8-10 $\mu g/m^3$ while a minority recommended 10-11 $\mu g/m^3$)
- EPA is proposing to revise the level of the primary annual $PM_{2.5}$ standard to within the range of 9-10 $\mu g/m^3$ and soliciting comment on revision as low as 8 $\mu g/m^3$ and as high as 11 $\mu g/m^3$

Proposal to Retain Other PM Standards

- The proposal also concludes that available information does not suggest the need to revise the primary 24-hour $PM_{2.5}$ standard, particularly if the level of the annual standard is revised (of 9 to 10 µg/m^3)
  - While the annual $PM_{2.5}$ standard (annual average) is generally viewed as protecting against "typical" daily and annual $PM_{2.5}$ exposures, the 24-hour $PM_{2.5}$ standard (98th percentile form) is generally viewed as protecting against short-term exposures to "peak" $PM_{2.5}$ concentrations
  - Decisions on public health protection focus on whether **together** these standards provide public health protection against the full distribution of short- and long-term $PM_{2.5}$ exposures
  - In most locations, a more stringent annual standard will ensure that daily peaks are well controlled (e.g., daily $PM_{2.5}$ concentrations would be below 25 µg/m^3)
- CASAC did not reach consensus on whether EPA should revise the level of the primary 24-hour $PM_{2.5}$ standard, with the majority of CASAC members recommending revising the level to 25-30 µg/m^3 and the minority recommending retaining the standard
- EPA is proposing to retain the primary 24-hour $PM_{2.5}$ standard and soliciting comment on revising the level down as low as 25 µg/m^3

Proposal to Retain Other PM Standards (continued)

Primary PM_{10} Standard

- The PM_{10} standard is set to protect against $PM_{10-2.5}$ exposures (the "coarse fraction")
- While the scientific evidence continues to generally suggest that a range of heath effects are linked to $PM_{10-2.5}$ exposures, the available evidence, including uncertainties, does not call into question the adequacy of the protection provided by the primary PM_{10} standard
- CASAC did not advise EPA to revise the primary PM_{10} standard
- EPA is proposing to retain the current primary PM_{10} standard

Secondary PM Standards

- The available evidence continues to support that PM contributes to visibility impairment, climate effects, and damage to materials
- In assessing the scientific evidence and quantitative information, including uncertainties, EPA found that the current secondary PM standards continue to provide adequate protection against these effects
- CASAC did not advise EPA to revise the secondary PM standards
- EPA is proposing to retain the current secondary standards and is soliciting comment on revising the secondary 24-hour $PM_{2.5}$ standard down as low as 25 $\mu g/m^3$ with a focus on protection against visibility effects

Proposed Modification of Monitoring Network

- Propose modifying the $PM_{2.5}$ network design criteria to require monitoring in at-risk communities where there are anticipated effects from sources in the area contributing to poor air quality.
  - Specifically: "For areas with additional required SLAMS, a monitoring station is to be sited in an at-risk community where there are anticipated effects from sources in the area (for example: a major port, rail yard, airport, or industrial area)."
  - As written the network design proposed change does not add a requirement for new monitors, rather it utilizes existing sites and ensures at risk communities are considered if sites need to move.
- Note: any new or moved monitors as a result of the modification in the PM NAAQS rule revision (if finalized) would not be in effect for the upcoming $PM_{2.5}$ designations cycle.

Proposed Revisions to the Air Quality Index (AQI)

- EPA is proposing updates to the Air Quality Index (AQI) for $PM_{2.5}$
  - The AQI is EPA's color-coded tool used by state and local governments to help inform the public about current and daily air quality and recommends steps that individuals can take to reduce their exposure to air pollution
  - The AQI converts $PM_{2.5}$ concentrations to a number on a scale from 0 to 500
- EPA is proposing to update the lower breakpoints (50, 100, 150) based on the proposed levels of the primary standards and related health evidence
- EPA is also proposing to update the upper breakpoints (200+) to reflect the newest scientific information
- EPA is soliciting comments on these proposed revisions and the approach to establishing breakpoints

Proposed Revisions to AQI for $PM_{2.5}$

AQI Value	Current [µg/m³]	Proposed Revisions [µg/m³]
0, Good	0	0
50, Moderate	12	Annual Standard (e.g., 9-10)
100, USG	35	Daily Standard
150, Unhealthy	55	Change with Daily Standard
200, Very Unhealthy	150	125
300, Hazardous	250	225
500, Hazardous*	500	325

*The 500 breakpoint is used in conjunction with the 300 breakpoint to calculate AQI values within the hazardous category. The proposed approach does not use the 500 breakpoint to determine other breakpoints values.

Public Health Benefits of Proposed Changes

- **Stronger standards will save lives –** Strengthening the annual $PM_{2.5}$ standard could result in significant public health benefits, including as many as 1,700 avoided premature deaths and 110,000 avoided lost workdays for a standard level of 10 µg/m³ in 2032 and as many as 4,200 avoided premature deaths and 270,000 avoided lost workdays for standard level of 9 µg/m³ in 2032.
- **Stronger standards will save health costs –** Strengthening the annual $PM_{2.5}$ standard could result in significant public health net benefits of as much as $17 billion for a standard level of 10 µg/m³ in 2032 and as much as $43 billion for a standard level of 9 µg/m³ in 2032.
- **Stronger standards will better protect overburdened communities –** EPA conducted extensive analyses showing that in general more stringent PM standards are expected to mitigate both exposure and mortality risk disparities for overburdened communities.

Estimated Monetized Benefits, Costs, and Net Benefits Associated with the Proposed Primary Standard Levels in 2032 for the U.S. (millions of 2017$)

	10 µg/m³	9 µg/m³
Benefits[a]	$8,500 and $17,000	$21,000 and $43,000
Costs[b]	$95	$390
Net Benefits	**$8,400 and $17,000**	**$20,000 and $43,000**

Notes: Rows may not appear to add correctly due to rounding. We focus results to provide a snapshot of costs and benefits in 2032, using the best available information to approximate social costs and social benefits recognizing uncertainties and limitations in those estimates.

[a] The benefits are associated with two point estimates from two different epidemiologic studies, and we present the benefits calculated at a real discount rate of 3 percent.
[b] The costs are annualized using a 7 percent interest rate.

Public Comment and Public Hearings

- EPA will conduct a virtual public hearing for this proposed rulemaking.
  - Sessions will begin at 11:00 am Eastern Time and conclude at 7:00 pm ET each day.
  - EPA will begin pre-registering speakers for the hearing upon publication of the announcement of the public hearing in the Federal Register.
  - The Federal Register notice announcing the public hearings will provide more details, including the dates of the hearing and how to register, and this information will also be made available at https://www.epa.gov/pm-pollution/national-ambient-air-quality-standards-naaqs-pm.

- Public comments can be submitted at http://www.regulations.gov by searching for Docket ID No. EPA-HQ-OAR-2015-0072.

Establishing and Meeting a NAAQS

A 2-Step Process:

- Step 1: ***Setting the standards*** **-** Requires EPA to conduct an extensive scientific review to determine whether new standards are necessary to protect public health and welfare.
  - The Clean Air Act bars EPA from considering cost or attainability in setting the NAAQS.
- Step 2: ***Implementing the standards*** - Requires states, and tribes where appropriate, to reduce harmful pollution to meet the standards.
  - The Clean Air Act specifies that cost, technical feasibility and the time needed to meet the standards are all factors that should be taken into account in this phase.
  - State and federal programs have a proven record of improving air quality while the economy grows. EPA will use long-standing provisions in the law to work with state, tribal and local partners to make sure any revised standards are implemented in a flexible and cost-effective way.

<u>This proposal does not make any air quality attainment/nonattainment designations. The separate designations process will begin after EPA issues a final decision on the PM NAAQS.</u>

Implementation

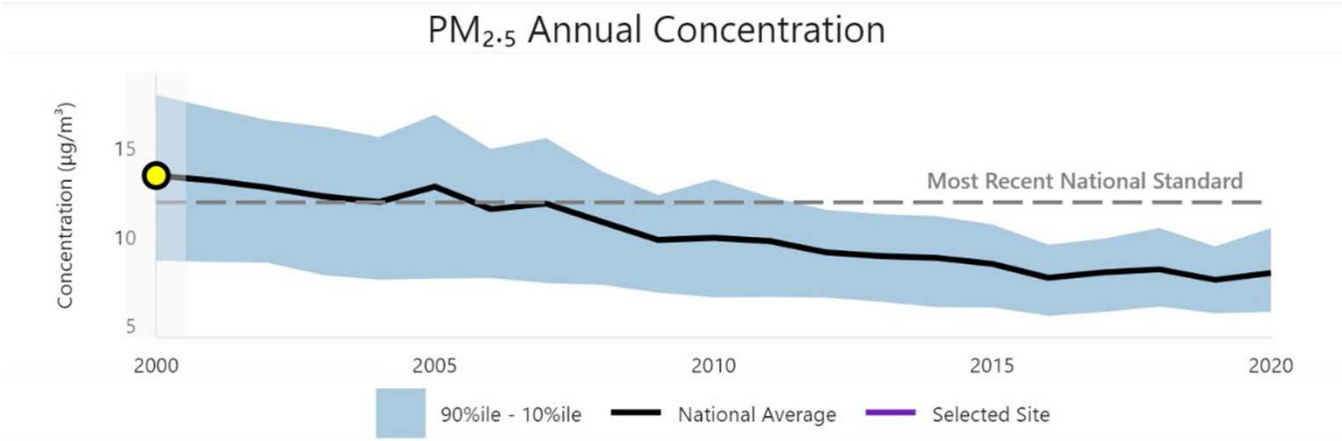
- EPA and the states are currently implementing emissions standards and pollution control programs that could help some areas bring $PM_{2.5}$ concentrations to levels that would meet any revised PM standards over the next 10 years.
- In addition, EPA expects to adopt additional measures that could further help some areas in reaching the proposed standards. These include:
  - Emission standards for power plants
  - Methane standards for oil and gas sector operations
    - e.g. "Supplemental Proposal to Reduce Methane and Other Harmful Pollution from Oil and Natural Gas Operations" (Nov. 2022)
  - Multipollutant emissions standards for cars and trucks
    - e.g. "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards" (Dec. 2022)
  - Funding under the Bipartisan Infrastructure Law and the Inflation Reduction Act aimed at reducing pollution from school buses and trucks, port operations, and electricity generation

Designations/Implementation Timeline

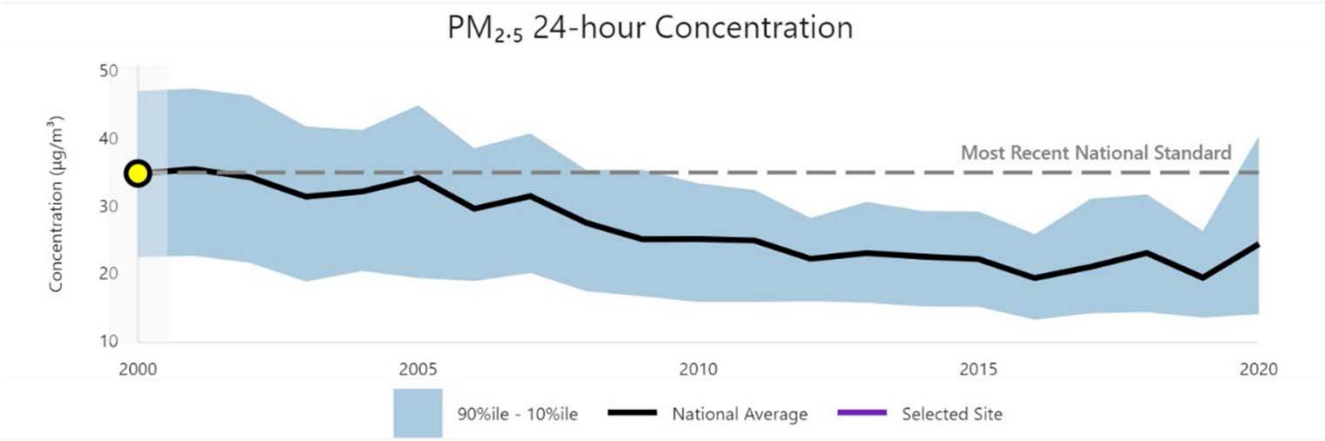
- The Clean Air Act directs EPA and states to take the following actions to deliver public health benefits following promulgation of a new/revised $PM_{2.5}$ NAAQS:
  - **Stationary source permitting.**
    - Prevention of Significant Deterioration (attainment area permitting) applies with respect to a new standard in all areas of the U.S. designated attainment for the pollutant upon the effective date of the new standard.
    - Nonattainment New Source Review applies in areas designated nonattainment for the pollutant, which includes any areas newly designated nonattainment at/after the effective date of nonattainment designations.
  - **Within 2 years after a final NAAQS:** For areas with available information, EPA must "designate" areas as meeting (attainment areas) or not meeting (nonattainment areas) the final NAAQS considering the most recent air quality monitoring data and input from states and tribes. All $PM_{2.5}$ nonattainment areas are initially designated as “Moderate.”
  - **Within 3 years after a final NAAQS:** Clean Air Act section 110 requires all states to submit state implementation plan revisions to show they have the basic air quality management program components in place to implement the final NAAQS.
  - **Within 18 months after the effective date of designations:** Nonattainment area $PM_{2.5}$ state implementation plans are due.
  - **End of the 6th calendar year after the effective date of designations**: “Moderate” area attainment date.

National Trends in Ambient $PM_{2.5}$

Seasonally-weighted Annual average $PM_{2.5}$

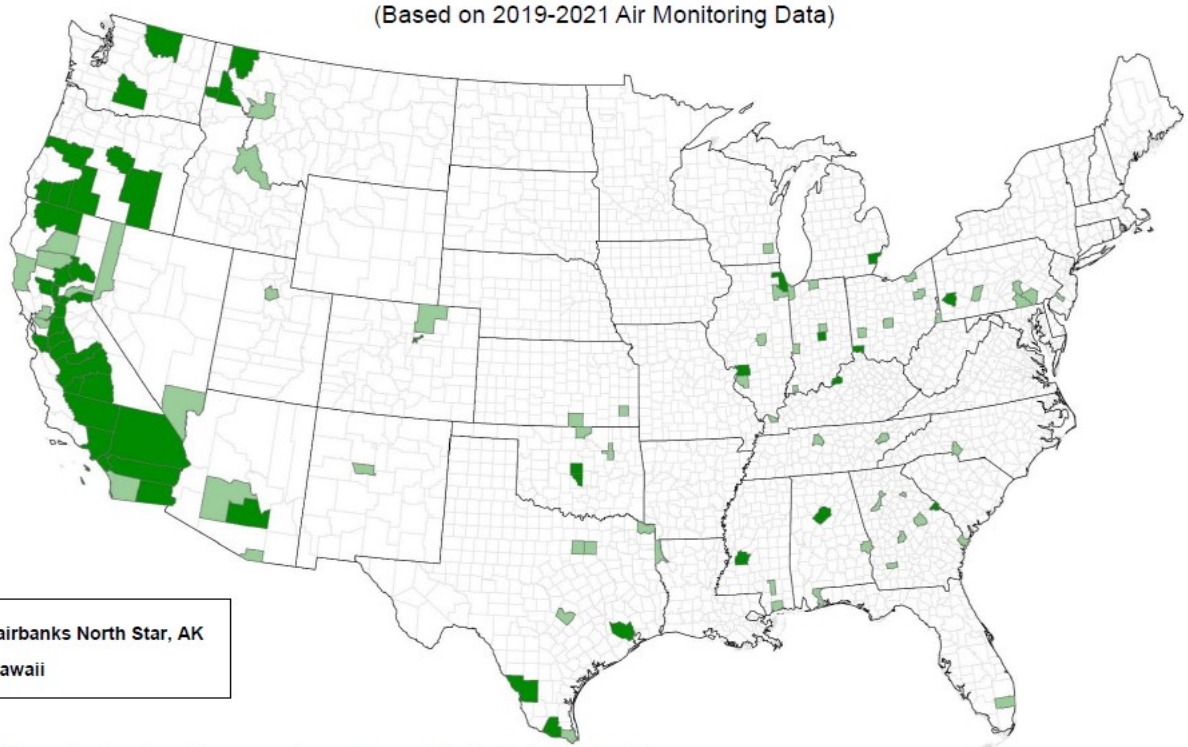


98th percentile 24-hour $PM_{2.5}$



Current Air Monitoring Data Show Some Counties Would Not Meet Proposed Primary Fine Particle Standards

(Based on 2019-2021 Air Monitoring Data)



50 counties do not meet a proposed annual fine particle standard of 10.0 ug/m^3

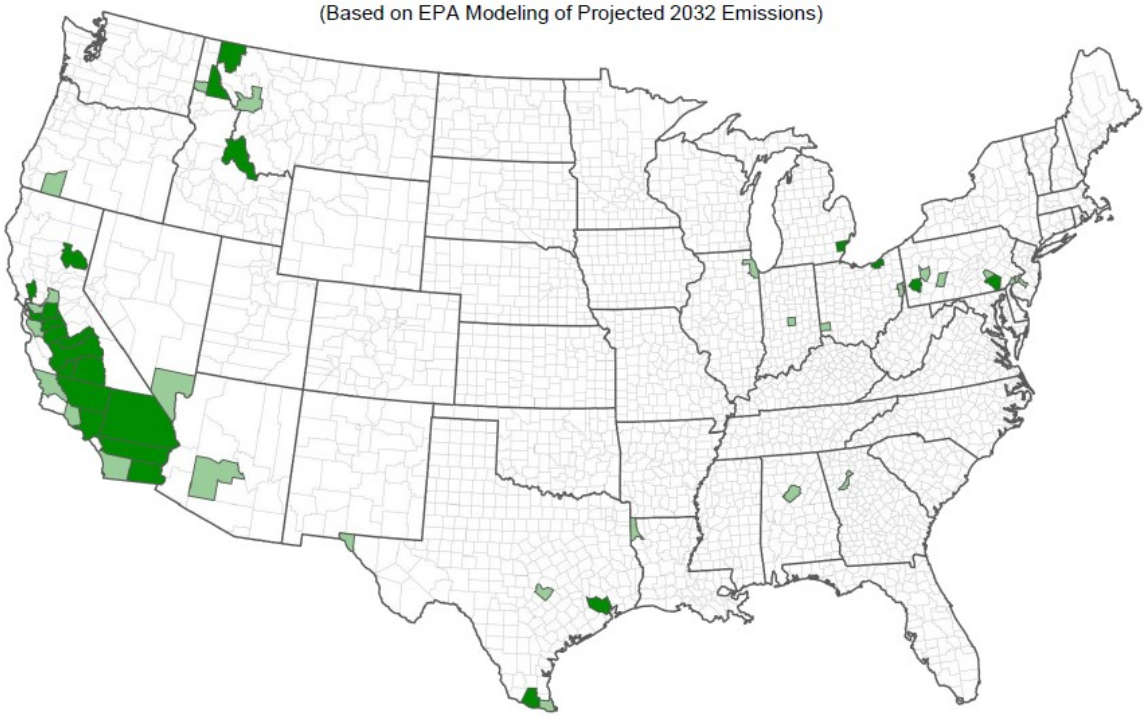
62 additional counties do not meet a proposed annual fine particle standard of 9.0 ug/m^3

Note: Map reflects monitored counties with complete monitoring data. See accompanying table for more detail. Future area designations (attainment/ nonattainment) will not be based on these data, but likely on monitoring data collected between 2021 and 2024. Of the 112 counties with 2019-2021 design values above 9 ug/m^3, 24 counties are totally or partially contained in nonattainment areas for the current $PM_{2.5}$ standards.

This information is provided for illustrative purposes only and is not intended to project or predict the outcome of any forthcoming designations process.

EPA Projections Show Most Counties Would Meet the Proposed Primary Fine Particle Standards in 2032

(Based on EPA Modeling of Projected 2032 Emissions)



24 counties are projected not to meet a proposed annual fine particle standard of 10.0 ug/m^3 in 2032

27 additional counties are projected not to meet a proposed annual fine particle standard of 9.0 ug/m^3 in 2032

Note: Future fine particle pollution levels were projected only for counties with monitoring data and within the contiguous 48 states. See accompanying table for more detail. Modeled emissions are developed from a 2016 base year and used in projecting 2014-2018 monitoring data. Projected emissions reflect expected reductions from federal regulations that have been finalized as of Spring 2021. Some areas may have longer than 2032 to attain the $PM_{2.5}$ standards.

This information is provided for illustrative purposes only and is not intended to project or predict the outcome of any forthcoming designations process.

Additional Resources

- Information on particulate matter (PM) pollution: https://www.epa.gov/pm-pollution
- Information on the Reconsideration of the PM NAAQS, including fact sheets and upcoming public hearing information: https://www.epa.gov/pm-pollution/national-ambient-air-quality-standards-naaqs-pm
- Information on the PM NAAQS review process and other related documents: https://www.epa.gov/naaqs/particulate-matter-pm-air-quality-standards