

Facts About Particulate Matter Air Pollution

What is Particulate Matter?

Particulate matter (PM for short) refers to the many types and sizes of particles suspended in the air we breathe each day. PM include products of combustion, such as soot or ashes, wind blown dust, and minute droplets of liquids known as aerosols.¹ PM can range in size from visible pieces of sand and dirt to microscopic particles so small that 500,000 of them could fit on the period at the end of this sentence.

Why should you be concerned about PM?

Particulate matter not only impairs visibility, it also poses a serious health threat to Washington citizens. Our respiratory systems are equipped to filter out larger particles. However, the lungs are vulnerable to particles less than 10 microns in diameter (PM₁₀), which can slip past the respiratory system's natural defenses. Very tiny particles (PM_{2.5}) can penetrate deeply into the lungs and do the most harm.² The PM we breathe enter the lungs and pass through progressively smaller airways until they reach the alveoli, tiny air sacs where oxygen enters the blood stream. PM that gets trapped in these most sensitive tissues interfere with oxygen uptake and cause airway inflammation.³ Toxic and cancer-causing compounds can "hitchhike" into the lung on PM and be directly absorbed into the lungs.⁴

What are the health effects of PM air pollution?

PM air pollution can cause coughing, wheezing, and overall decreased lung function in otherwise healthy children and adults. Particulate pollution can trigger asthma attacks and respiratory illness in the more sensitive subgroups of the population, such as the elderly and those with heart or lung disease.⁵ Children are more susceptible to PM because they have smaller lungs and less mature immune systems.⁶ PM also aggravates the cardiac system causing systemic inflammation and dysrhythmia. In the past 10 years, more than two dozen health studies have linked high concentrations of particulate pollution with an increase in emergency room visits, hospital admissions, and even premature deaths.⁷

What causes PM air pollution?

PM is introduced to the air through both natural and human causes. The primary sources of PM in Washington State, excluding agricultural dust, are motor vehicles; diesel trucks and buses; residential wood stoves and fireplaces; industrial emissions; agricultural, slash and yard waste burning; and even exhaust from lawn mowers and boats.⁸ PM concentrations tend to be especially high in areas with greater population density, nearby industries or agriculture, or where local topography or weather conditions contribute to air stagnation.

Here are a couple of quick facts about sources of particulate matter in Washington State:

- During wintertime air inversions, wood stoves and fireplaces release more hazardous particles than industry and motor vehicle sources combined.
- Diesel trucks and buses are major producers of particulate matter and should be replaced with natural gas-, methanol-, or electric- powered vehicles
- As our population increases, our vehicle miles traveled increases at a much higher rate, which means more cars on the road and more air pollution from motor vehicle exhaust
- Industrial emissions are a major source of air pollution. The best control technologies should be encouraged to protect human health and the environment
- Outdoor burning includes agricultural, slash, and yard waste burning. The smoke from these types of fires can be especially intense, having a large impact.

What is being done to control PM air pollution?

Our nation's Clean Air Act of 1970, in combination with important amendments adopted in 1977 and 1990, requires that the United States Environmental Protection Agency (EPA) identify and set standards for air pollutants. These National Ambient Air Quality Standards (NAAQS) must be strict enough to protect the health of even the most sensitive members of the population PM₁₀ is currently one of six "criteria" pollutants identified by the EPA.⁹

Here in Washington State, the Department of Ecology and local air pollution control agencies cooperate with the EPA to implement laws designed to reduce PM levels. The Clean Air Washington Act of 1991 established a comprehensive set of laws to prevent and control air pollution.

A New PM Standard?

Though our air quality has improved since adoption of these laws, our visibility has worsened.¹⁰ There is also mounting evidence that the PM¹⁰ standards may not be strict enough to protect lung health. A 1996 analysis by the Natural Resources Defense Council (NRDC) estimates that PM levels far below current air pollution limits contribute to over 1,000 premature deaths each year in Washington State. Experts suggest that changing the PM standard to contain limits on fine particles (those 2.5 microns or less in diameter) would better protect lung health.¹¹ A PM_{2.5} standard might mean tougher restrictions on diesel trucks and buses, wood stove and fireplace usage, outdoor burning, and industrial sources. It will also mean that Washington citizens will breathe easier and spend less on health care to treat PM-induced illnesses. A 1995 American Lung Association report estimated that over \$345 million a year in health costs might

be saved if Washington State adopted stricter PM₁₀ standards such as those in California.¹²

References

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Criteria Air Pollutants

Pollutant	Sources	Health Effects	Standard
Particulate Matter (PM)	Wood Burning, motor vehicles, industry, outdoor burning, windblown dust, construction, mining, unpaved roads, diesel	Eye and nose irritation, airway irritation, decreased lung function, increased respiratory illness, premature mortality	PM ₁₀ 150µg/m ³ (24-hour average) PM ₁₀ 50µg/m ³ (annual average) PM _{2.5} 65µg/m ³ (24-hour average) PM _{2.5} 15µg/m ³ (annual average)
Carbon Monoxide (CO)	Motor vehicles, wood burning, open burning	Headache, dizziness, nausea, unconsciousness, death, interference with blood's ability to carry oxygen to the brain and other tissues	9 ppm (8-hour average) 35 ppm (1-hour average)
Ozone (O₂)	Secondary pollutant, main component of smog, formed when hydrocarbons combine with nitrogen oxides in sunlight. Sources: auto emissions, gas stations, solvents, paints, industry	Decreased lung function; shortness of breath; chest pain on deep inspiration; wheezing and coughing; irritation of eyes, nose and throat	0.12 ppm (1-hour average)
Sulfur Dioxide (SO₂)	Burning of sulfur-containing fuel, coal-fired power plants, smelters, pulp and paper mills, diesel engines	Increased symptoms in people with asthma, asthma attacks, shortness of breath and wheezing	0.02 ppm (annual average) 0.10 ppm (24-hour average) 0.40 ppm (1-hour average)
Lead (Pb)	Leaded gasoline, lead smelting, battery manufacture and recycling, lead-containing paint	Motor function and learning affected; damage to the central nervous system, kidneys, and brain. Children are especially at risk	1.5µg/m ³ (quarterly average)
Nitrogen Dioxide (NO₂)	Burning of fuel in power plants and motor vehicles, fertilizer manufacturing	Irritated bronchial and respiratory systems, asthma attacks, increased infections	0.05 ppm (annual average)
<p>Ppm = parts per million, by volume µg/m³ = micrograms per cubic meter</p>			

What can you do to reduce PM pollution?

- *Try biking, walking, carpooling, or riding public transit instead of driving.*

The influx of people to Washington State has meant not only more cars, but more people driving longer and longer distances. Staying out of your car reduces traffic congestion and air pollution. If you must drive, keep your car well-tuned, carpool, consolidate short trips, and keep distances to a minimum

- *Replace your old wood stove with a natural gas, propane, oil or electric furnace.*

If wood burning is your sole source of heat, be a responsible wood stove or fireplace user. Make sure your wood stove is certified and complies with local regulations. Burn only dry wood. Stay alert to air quality conditions and the local burn ban status. Don't use your wood stove or fireplace when the air is dirty and the winds are calm.

- *Reduce, reuse, and recycle in your home.*

The fewer products we consume, the less air pollution *is* created through manufacturing and disposal.

- *Support policies that encourage alternative transportation.*

Replacement of diesel trucks and buses with vehicles that run on natural gas or electric power will reduce particulate matter in the air we breathe.

- *Try composting or yard waste pick-up instead of burning garbage and yard waste. Support policies that encourage alternatives to agricultural burning.*

Even fires that burn for a short time produce substantial amounts of smoke and particulate matter. They can also be a fire hazard. Burning garbage is also illegal, for a variety of reasons.

- *Actively support strong legislation and regulation requiring effective control of air pollution.*

One way to do this is to become a member of the American Lung Association of Washington's Legislative Network. Make your voice heard at the local, state and federal levels on air pollution issues.