

Particulate Matter and Health Fact Sheet

What is Particulate Matter?

Airborne particulate matter (PM) is not a single pollutant, but rather a complex mixture of particles that vary widely in size, shape and chemical composition. Particles with a diameter of 10 microns or less (PM₁₀) are particles small enough to pass through the throat and nose and enter the lungs. PM₁₀ can be comprised of smoke, soot, salts, acids, metals, and dust, including wind-blown dust from disturbed natural lands.

What is Windblown Dust?

Dust is emitted from loose soils or disturbed natural lands by wind through a process termed saltation. Saltation is the wind-driven, hopping motion of particles across a surface. This motion not only transports larger particles but also initiates the transport and suspension of smaller dust particles.

Weather conditions, the natural environment, and human activities can cause windblown dust that contributes to air pollution. High winds can raise large amounts of dust from areas of loose soils or disturbed lands. PM₁₀ particles make up a large portion of windblown dust and high PM₁₀ concentrations can be common downwind of loose or disturbed soils during wind events.

What are the Harmful Effects of PM₁₀?

Adverse health impacts have been associated with both short and long term exposure to PM₁₀. PM₁₀ particles can be inhaled and deposited throughout the airways in the upper regions of the lung. Particles deposited on the lung surface can induce tissue damage and lung inflammation, impacting respiratory and cardiovascular health. Exposure to PM₁₀ can lead to:

- reduced lung function;
- worsening of asthma and other respiratory diseases;
- increased hospitalization and emergency department visits;
- faster disease progression; and
- reduced life expectancy.

Who is at the Greatest Risk from Exposure to PM₁₀?

Research points to older adults with chronic heart or lung disease, children, and asthmatics as the groups most likely to experience adverse health effects with exposure to PM₁₀. Children and infants are susceptible to harm from inhaling pollutants such as PM because they inhale more air per pound of body weight than do adults - they breathe faster, spend more time outdoors and have smaller body sizes. In addition, children's immature immune systems may cause them to be more susceptible to PM than healthy adults.

What are the Air Quality Standards for PM₁₀?

Ambient air quality standards are designed to prevent impacts on health and the environment by defining the maximum amount of pollutant that can be present without harming human health. The

United States Environmental Protection Agency (U.S. EPA) sets National Ambient Air Quality Standard (NAAQS) for PM10 nationwide. CARB sets ambient air quality standards (CAAQS) for California, which are often more stringent than the national standards.

PM10 is regulated on the State and national level without exception as total concentration of particulate matter per volume of air regardless of chemical composition. Health studies were extensively reviewed when setting the PM10 ambient air quality standards. Substantial evidence supported negative health impacts of PM10 exposure across different PM10 source mixtures.

| PM10 Air Quality Standard | 24-Hour Average | Annual Average |
|---|-----------------------|----------------------|
| National Ambient Air Quality Standard (NAAQS) | 150 µg/m ³ | N/A |
| California Ambient Air Quality Standard (CAAQS) | 50 µg/m ³ | 20 µg/m ³ |

How is Windblown Dust Controlled?

Wind-blown dust is caused by wind action close to the ground surface. Dust control methods use various means to limit dust movement. Primary ways to prevent or reduce dust emissions include:

- limiting the creation or presence of dust-sized particles;
- reducing wind speed at ground level; and
- binding dust particles together.

This may be done by adding surface roughening features, encouraging or managing the growth of vegetation, or creating structures that act as wind breaks. Other methods include direct application of water to emissive surfaces such as shallow flooding or for habitat management.

What are the Statewide Efforts to Reduce Windblown Dust?

Wind-blown dust is a concern for air quality statewide, from the coast to the desert. Various dust control methods are employed around California, depending on local soil properties, topography, and meteorology. No one method is universally applicable. Some dust control methods, such as habitat restoration and managed vegetation, need time to reach full effectiveness in reducing windblown dust. Common dust control efforts throughout the state include, but are not limited to:

- Habitat restoration: Projects use water to form ponds or support vegetation, and have the co-benefit of restoring habitat and controlling dust emissions.
- Managed vegetation and enhanced vegetation projects: Decreases both dust movement and soil erosion. Vegetation acts as a windbreak, which lowers wind speeds and reduces sand movement that leads to dust emissions.
- Tillage: Deep furrows in the soil reduce wind speed at the surface, improving resistance to wind erosion and trapping windblown soil particles, common in agricultural and arid regions.
- Wind fencing: Fences designed in an array that slow surface winds and allow particle deposition to occur, reducing the dust emission process.
- Engineered roughness: Large elements (such as straw bales) are placed at prescribed intervals on emissive surfaces that mimic the effects of vegetation, lowering surface wind speeds and dust emissions.