

## List of Regulated Pollutants

In general there are two main types of regulated pollutants – criteria pollutants and hazardous air pollutants (HAPs). For a complete list of regulated air pollutants, please refer to the Code of State Regulations, specifically 10 CSR 10-6.020(3) at the following website:

<http://www.sos.mo.gov/adrules/csr/current/10csr/10csr.asp>.

**Criteria pollutants** - These pollutants have human health-based or welfare-based standards that set the maximum concentrations that are allowed in the ambient air (i.e. the air that the general public is exposed to). The federal standards for the criteria pollutants are known as the National Ambient Air Quality Standards (NAAQS). These criteria pollutants include particulate matter less than 10 microns in diameter (PM<sub>10</sub>), particulate matter less than 2.5 microns in diameter (PM<sub>2.5</sub>), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), ozone, nitrogen dioxide (NO<sub>x</sub>) and lead. Missouri has two additional pollutants which have ambient air quality standards in addition to the NAAQS. These include hydrogen sulfide and sulfuric acid. The table below describes each pollutant, including its sources and health and environmental effects. A list of all Ambient Air Quality Standards can be found at 10 CSR 10-6.010.

Table 1: EPA Criteria Air Pollutants

Pollutant	Sources	Health and Environmental Effects
<b>Ozone (ground-level):</b> Ozone is a colorless gas that is not usually emitted directly into the air, but at ground-level. Ground-level ozone is the primary constituent of smog.	Created by a chemical reaction between NO <sub>x</sub> and volatile organic compounds (VOC) in the presence of sunlight. Sources include motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents as well as natural sources that emit NO <sub>x</sub> and VOC.	Breathing ozone can trigger a variety of health problems including chest pain, coughing, throat irritation, and congestion. It can worsen bronchitis, emphysema, and asthma. Ground-level ozone also can reduce lung function and inflame the linings of the lungs. May reduce yield of agricultural crops and damage forests and other vegetation.
<b>Carbon Monoxide (CO)</b> - An odorless, colorless gas resulting from incomplete fossil fuel combustion. Carbon monoxide is also produced from incomplete combustion of many natural and synthetic products.	Sources include motor vehicles, small engines, some industrial processes, boilers and incinerators. High concentrations can be found in confined spaces like parking garages, poorly ventilated tunnels, or traffic intersections especially during peak hours.	Impairs the ability of blood to deliver oxygen to vital tissues affecting the cardiovascular, pulmonary, and nervous systems. Symptoms include dizziness, headaches, nausea, fatigue, memory and visual impairment, and decreased muscular control. May contribute to the formation of smog.
<b>Nitrogen Oxides (NO<sub>x</sub>):</b> NO <sub>x</sub> is a generic term for a group of highly reactive gases, which contain nitrogen and oxygen in varying amounts. Many nitrogen oxides are colorless and odorless. However, one common pollutant, nitrogen dioxide (NO <sub>2</sub> ) along with particles in the air can often be seen as a	Formed when fuel is burned at high temperatures, as in a combustion process. The primary sources of NO <sub>x</sub> are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels.	Irritates the lungs, may cause lung damage and lower resistance to respiratory infections such as influenza. Contributes to the formation of ozone and acidic precipitation (acid rain), and may adversely affect terrestrial and aquatic ecosystems through regional transport and deposition.

reddish-brown layer over many urban areas.		
<b>Sulfur Dioxide (SO<sub>2</sub>):</b> Sulfur dioxide is a colorless gas, odorless at low concentrations, but pungent at very high concentrations.	Formed when fuel containing sulfur (mainly oil and coal) is burned in industrial, institutional, utility, and residential furnaces and boilers. Other sources include petroleum refineries, smelters, paper mills, and chemical plants.	May cause breathing problems, respiratory illness, alterations in the lungs' defenses, aggravation of existing cardiovascular disease, and permanent damage to lungs. Forms acid aerosols and sulfuric acid, which are associated with acidification of lakes and streams, accelerated corrosion of buildings and monuments, and reduced visibility.
<b>Particulate Matter (PM)</b> – PM is a term for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets. Some particles are large or dark enough to be seen as soot or smoke. Others are so small that individually they can only be detected with an electron microscope.  See below for further discussion of PM <sub>10</sub> and PM <sub>2.5</sub> .	Formed directly from windblown dust, crushing and grinding operations, unpaved roads and construction, fuel combustion (from motor vehicles, power plants, industrial facilities), wood stoves, and agriculture (plowing, burning off fields). May also be formed in the atmosphere from gases such as SO <sub>2</sub> and NO <sub>x</sub> .	Causes eye, nose and throat irritation, lung damage, bronchitis, cancer, alterations in the body's defense system against foreign materials, and premature death. Children, the elderly, and people suffering from heart or lung disease are especially at risk. Serves as a carrier for toxic metals, damages human-made materials, and is a major cause of reduced visibility (haze) in many parts of the U.S.
<b>Lead</b> – A heavy metal which can cause adverse health effects either through ingestion or direct inhalation.	Sources include lead-contaminated soil, dust, paint, etc., transportation sources using lead in their fuels, coal combustion, smelters, car battery plants, and combustion of garbage containing lead products.	Elevated levels can cause brain and other nervous system damage and adversely affect kidney function, blood chemistry, and digestion. Children are at special risk due to cumulative effects even at low doses. Lead can also harm wildlife through deposition onto leaves which are a food source for grazing animals.

*Information in table from EPA and New Hampshire Department of Environmental Services, Environmental Fact Sheet ARD-41*

Other related pollutants:

- Particulate Matter, Coarse (PM<sub>10</sub>)**  
 In July 1987, EPA began using a new indicator, PM<sub>10</sub>, which includes only those particles with aerodynamic diameter smaller than 10 microns. Ten microns is approximately one seventh the diameter of a human hair. This fraction of total suspended particulate (TSP) is responsible for most of the adverse human health effects of particulate matter because of the particles' ability to reach the lower regions of the respiratory tract.
- Particulate Matter, Fine (PM<sub>2.5</sub>)**  
 In July 1997, EPA added air quality standards for PM<sub>2.5</sub>, particulate matter with aerodynamic diameter smaller than 2.5 microns, also referred to as fine particulate matter. PM<sub>2.5</sub> is a complex mixture of very small liquid droplets or solid particles in the air. These particles can be directly released when coal, gasoline, diesel fuels and wood are burned or they can also be formed in the atmosphere from chemical reactions of nitrogen oxides, sulfur oxides, organic compounds and ammonia.
- Volatile Organic Compounds (VOC)** [not a criteria pollutant]

Although VOCs are not by themselves a criteria pollutant, it is a principal component in atmospheric reactions that form ozone and other photochemical oxidants. VOCs are emitted from diverse sources, including automobiles, chemical manufacturing facilities, drycleaners, paint shops and other commercial and residential sources that use solvent and paint. The term, volatile organic compound is defined in federal rules as a chemical that participates in forming ozone. Methane, a nonreactive compound is not a VOC, nor are other organic chemicals with negligible photochemical reactivity. VOCs are emitted from transportation and industrial sources, such as automobile exhaust, gasoline/oil storage and transfer, chemical manufacturing, dry cleaners, paint shops and other facilities using solvents.

Table 2: Missouri's Other Criteria Air Pollutants

Pollutant	Sources	Health and Environmental Effects
<p><b>Hydrogen Sulfide (H<sub>2</sub>S)</b> - Hydrogen sulfide is a colorless, very poisonous, flammable gas with the characteristic foul odor of rotten eggs at low concentrations and a sweetish odor at higher locations..</p>	<p>Hydrogen sulfide often results from the bacterial breakdown of organic matter in the absence of oxygen, such as in swamps and sewers (anaerobic digestion). It also occurs in volcanic gases, natural gas, and some well waters. The largest industrial route to H<sub>2</sub>S occurs in petroleum refineries: Other anthropogenic sources of hydrogen sulfide include coke ovens, paper mills (using the sulfate method), and tanneries. H<sub>2</sub>S arises from virtually anywhere where elemental sulfur comes in contact with organic material, especially at high temperatures.</p>	<p>Hydrogen sulfide can affect the body if it is inhaled or it comes in contact with the eyes, skin, nose or throat. It can also affect the body if it is swallowed. Inhalation of low concentrations may cause headache, dizziness and upset stomach. At higher concentrations hydrogen sulfide may cause loss of consciousness and death through respiratory paralysis and asphyxiation.</p>
<p><b>Sulfuric Acid (H<sub>2</sub>SO<sub>4</sub>)</b> - Sulfuric acid is a clear, colorless, oily liquid that is very corrosive.</p>	<p>Sulfuric acid is used in the manufacture of fertilizers, explosives, other acids, and glue; in the purification of petroleum; in the pickling of metal; and in lead-acid batteries (used in most vehicles). Much of the sulfuric acid in the air is formed from sulfur dioxide released when coal, oil, and gas are burned. SO<sub>3</sub> is formed when sulfur dioxide reacts with water in the air. Sulfuric acid dissolves in the water in air and can remain suspended in air for varying periods of time. Sulfuric acid is removed from the air in rain.</p>	<p>See SO<sub>2</sub>.</p>

**Hazardous air pollutants (HAPs)** - are defined by a list of chemicals that are known or suspected of causing cancer or other serious health effects, such as developmental effects or birth defects. There were originally 189 HAPs, but various rulemaking activities have removed and/or redefined some of the HAPs. For a comprehensive list of HAPs, see

<http://www.epa.gov/oar/data/help/hneihaps.html> There are no national ambient air quality standards for HAPs, however the State of Missouri requires potential HAPs emissions that exceed screening levels to be compared with health based standards. The screening levels are set by the Air Pollution Control Program and the standards are set by the Air Pollution Control Program in conjunction with the Department of Health and Senior Services. To view the most current list of screening levels and ambient air standards, see website.

For a complete list of regulated air pollutants and a list of named sources, please refer to the Code of State Regulations, specifically 10 CSR 10-6.020(3) at the following website:

<http://www.sos.mo.gov/adrules/csr/current/10csr/10csr.asp>.

