

Report to the Public 2015-2016



COLORADO

Air Quality Control Commission

Department of Public Health & Environment



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Message from the Chair of the Commission . . .

As a longtime resident of Colorado, I have witnessed a steady improvement in air quality in our towns and cities along with our beautiful natural areas. These gains have been made in the face of ever increasing population, commercial and industrial activity. We have been fortunate that many stakeholders, including small businesses, citizens, activists, and industry leaders, have come to the table to develop and support common sense, cost-effective measures that improve productivity while reducing emissions.

The Air Quality Control Commission (Commission), through this Annual Report to the Public, wishes to document these achievements while presenting some priorities for future work. Most significantly this past year, the Commission has:

- further educated itself on climate change issues in order to be in a better position to make informed future decisions;
- monitored the implementation of comprehensive oil and gas industry emission control regulations that minimize harmful hydrocarbon emissions;
- considered appeals from ethanol production facilities that dispute the State's permit enforcement decisions;
- tracked improvements to air quality in Colorado's national parks and wilderness areas;
- modernized and improved diesel vehicle emission control requirements in Front Range communities; and
- Traveled to Colorado Springs to hear local concerns.

This coming year will be important as many issues will be considered, including:

- consideration of a new ozone plan for the Front Range region;
- continuing assessment of ozone reduction measures to attain the new, more stringent standard;
- consideration of changes proposed for the regional haze State Implementation Plan;
- analysis of greenhouse gas emission reduction strategies; and
- continuing efforts to expand public awareness of Colorado's air quality issues.

Priorities for future work need to be based on good science, a solid understanding of existing Colorado rules and requirements, dialog between stakeholders, and input from interested persons from across the state. Cutting edge science is allowing a closer look at emission sources in all parts of the state - analysis of this air quality research will provide a better understanding of the contributions of these diverse sources of air pollutants and, with your help, will lead to solutions needed to address today's air quality issues.

I wish to express my appreciation to all who participated in activities to achieve and maintain healthy air quality throughout the State. I look forward to hearing from everyone in our continuing air quality planning efforts.

John Clouse, Chair
Air Quality Control Commission

Major air pollutants

There are many types of air pollution, from blowing dust to human-caused chemical emissions. The U.S. Environmental Protection Agency (EPA) has developed standards for six air pollutants that it calls "criteria pollutants" to protect the public's health and welfare. The standards indicate maximum allowable levels of the regulated pollutants in the air. EPA reviews and revises the standards periodically as necessary as new information on health and environmental effects becomes available.

The six criteria pollutants are particulate matter, ground-level ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, and lead.

In addition to criteria pollutants, another class of regulated air pollutants is "toxic air pollutants." Toxic air pollutants, also known as hazardous air pollutants, are those that are known or suspected to cause cancer or other serious health or environmental effects.

Greenhouse gases, such as carbon dioxide and methane, are pollutants that contribute to changes in our climatic environment. Climate change has been a growing concern in recent years, and Colorado and the nation are undertaking steps to reduce greenhouse gas emissions and their impacts.

Monitoring the Pollutants

The Colorado Air Pollution Control Division (Division) maintains a statewide monitoring network for all criteria pollutants as required by the federal Clean Air Act and at times conducts special studies of toxic air pollutants. Monitors are placed in areas where emissions sources and modeling suggest that air quality could be most impacted.

The following provides more detail about certain criteria pollutants of concern in Colorado. For more details on all the criteria pollutants and Colorado air monitoring sites and data, see our [monitoring and data website](#), or the annual [Colorado Air Quality Data Report](#).

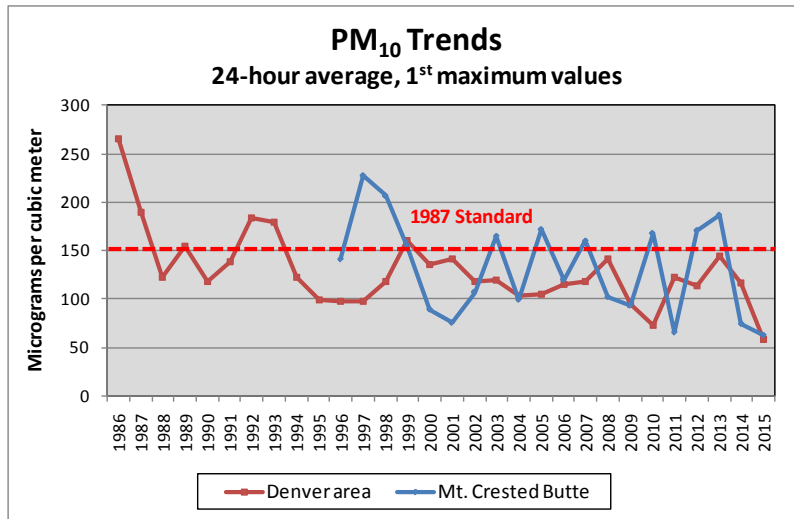
- Particulate matter.
- Ground-level ozone.
- Nitrogen oxides.
- Sulfur Dioxide.
- Carbon Monoxide.
- Lead.
- Hazardous air pollutants.
- Greenhouse gases.
- Regional haze.
- More information.

Major air pollutants - particulate matter

Small particles less than 10 microns in diameter (PM₁₀) are made up of a number of components, including inorganic ions (such as nitrate, sulfate, and aluminum), organic chemicals, metals, and soil or dust particles. A micron is 1 millionth of a meter. A human hair is about 60-70 microns in diameter.

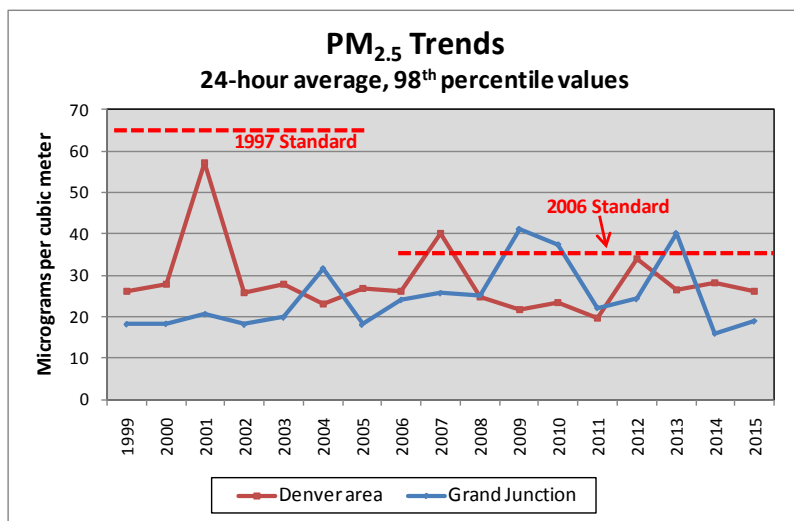
PM₁₀

PM₁₀ consists of solid and liquid material up to 10 microns in size suspended in the atmosphere. In Colorado, the majority of PM₁₀, about 74 percent, are from fugitive dust sources, including agriculture, construction, and paved and unpaved roads, according to the EPA's 2011 national emissions inventory.



PM_{2.5}

PM_{2.5} particles are a subset of PM₁₀ and include those particles up to 2.5 microns in size. PM_{2.5} can be directly emitted from stack emissions, internal engine combustion, wildfires or fugitive dust sources, or they can form when gases emitted from power plants, industries, automobiles, and agriculture react in the air. In Colorado, about 40 percent of directly emitted PM_{2.5} is from fugitive dust sources while roughly 31 percent is from fire-related activities, such as prescribed fires, wildfires, and residential wood smoke (according to EPA's 2011 NEI). Much of the PM_{2.5} in many urban and industrial locations is secondary, composed of sulfate, nitrate and ammonium compounds.



Health and Environmental Effects

Particulate matter can enter the lungs. Once inhaled, PM₁₀ and PM_{2.5} particles can affect the heart and lungs and cause serious health effects, including respiratory problems, cancer and premature mortality. The environmental effects range from visibility degradation to climate change and vegetation damage.

Impacts in Colorado

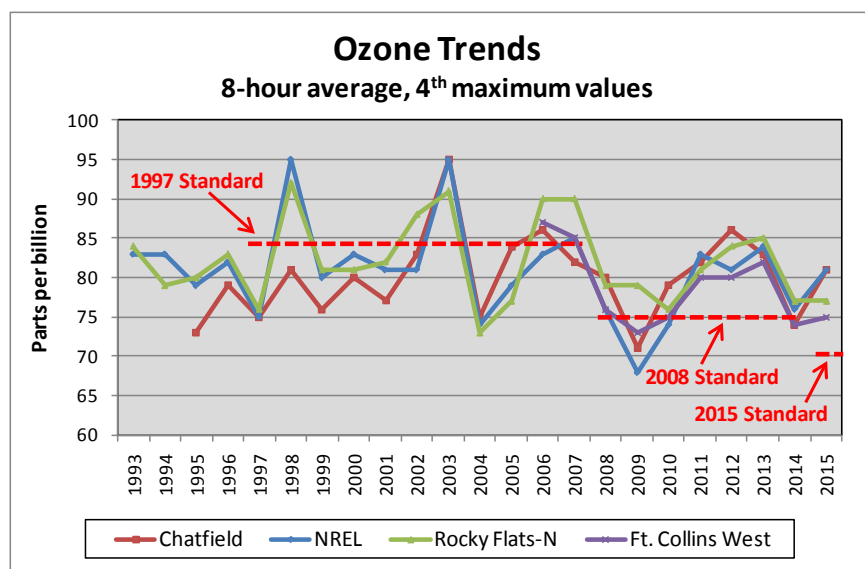
All monitoring sites in Colorado meet the federal standards for both PM₁₀ and PM_{2.5} pollution. However, particle pollution at times can cause localized air quality impacts resulting in adverse health impacts. The Division regularly issues advisories, encouraging citizens to minimize activities that cause emissions or encouraging citizens to limit exposure to poor air quality.

The charts show exceedances of particulate standards in recent years. These exceedances were caused either by winter temperature inversions that trap pollutants close to the ground or high winds that resulted in blowing dust. These exceedances do not result in violations because the standards are based on 3-year averages of monitored concentrations, and those averages are below the standards in these locations.

There is a new monitoring site just north of the intersection of I-25 and I-70 which began operating in October 2015. This PM_{2.5} monitor, as with other monitors in the Denver area, has recorded some 24-hour values that exceed the federal PM_{2.5} standard, but has not yet been in place long enough to establish a 3-year average. Monitoring will continue at this location in order to determine long-term trends and to assess compliance with the federal standard.

Major air pollutants - ground-level ozone

Ozone is formed through complex photochemistry involving volatile organic compounds (VOCs) and nitrogen oxides (NO_x) in the presence of sunlight. Ozone is not emitted directly. Instead, emissions of VOCs and NO_x from motor vehicles, industry, oil and gas production, and even vegetation contribute to ozone formation. Ozone is also transported into Colorado from other states and countries.



Ozone is colorless and odorless at ambient concentrations. In the upper stratosphere, naturally occurring ozone helps protect the earth from ultraviolet radiation. Colorado's highest ground-level ozone concentrations usually occur in the summer when hot, low-wind days cause reactive pollutants to form ozone. However, high ozone events have been observed in some rural areas in winter where oil and gas production activities are concentrated in basins that can trap air pollution. The Division regularly issues advisories, encouraging citizens to minimize activities that cause emissions or encouraging citizens to limit exposure to poor air quality.

Health and Environmental Effects

Ozone can cause breathing difficulties and respiratory infections in the elderly, the young and those with pre-existing ailments such as asthma, and can cause premature mortality. Even healthy people who exercise or work outdoors can experience respiratory effects from ozone. Ground-level ozone also can have detrimental effects on plants and ecosystems.

Impacts in Colorado

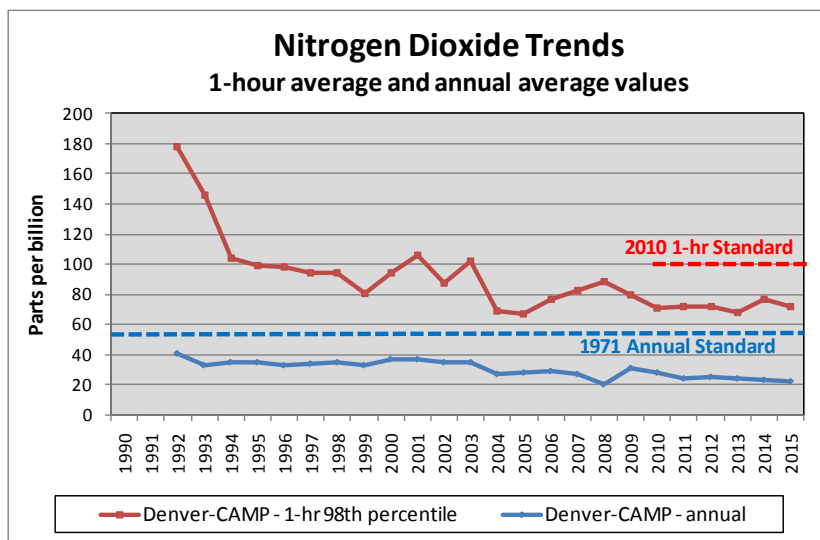
Much of Colorado has been and continues to attain federal ozone standards. However, the Denver Metropolitan and North Front Range areas have a history of violating these standards. The region has violated older, less stringent standards since the 1970's and throughout the 2000's. With EPA's promulgation of the more stringent 2008 8-hour standard of 75 parts per billion, and with EPA designating the region as a "marginal nonattainment area" in 2012, the state has continued efforts to reduce emissions aimed at attaining the ozone standard. Unfortunately, the region still violates the 2008 standard and has been bumped up to a "moderate nonattainment area" by EPA in 2016.

In recent years, the Commission has taken a number of regulatory efforts to reduce ozone levels. In 2014, the Commission adopted requirements to reduce hydrocarbon emissions from the oil and gas production sector that lead to ozone formation. When fully implemented, the regulatory revisions are expected to reduce VOC emissions by 93,000 tons per year in Colorado. The groundbreaking requirements will dramatically reduce hydrocarbon emissions from the sector, and are the first set of reduction strategies in the nation aimed at methane. These regulations are also part of Colorado's broader effort to reduce greenhouse gas emissions that lead to climate change. In 2011, the Commission approved a plan for reducing regional haze that includes substantial oxides of nitrogen (NOx) emission reductions that will improve ozone throughout the state. More than 35,000 tons per year of NOx reductions throughout Colorado are expected to occur by the year 2018 through these actions. Also, new federal motor vehicle emissions standards and Colorado's motor vehicle inspection and maintenance programs also help reduce precursors of ozone.

The EPA has implemented a new, more stringent ozone standard of 70 parts per billion, which was promulgated in October 2015. Colorado will commence planning for the new 70 parts per billion standards in 2017.

Major air pollutants - nitrogen oxides

Nitrogen oxides comprise a group of highly reactive gases that contain nitrogen and oxygen in varying amounts. NOx play a major role in the formation of ozone, particulate matter, haze and acid rain. NOx is an "ozone precursor." The majority of NOx is nitrogen dioxide (NO₂) and nitric oxide (NO). NO₂ is a reddish brown, highly reactive gas that is formed in the ambient air through the oxidation of NO. The major sources of man-made NOx emissions are high-temperature combustion processes such as those in automobiles, industrial engines and power plants.



Health and Environmental Effects

NO_x reacts in the air to form ground-level ozone and fine particle pollution, which are associated with adverse health effects. NO₂ can increase respiratory problems, cause symptomatic effects in asthmatic individuals and increase susceptibility to respiratory infections.

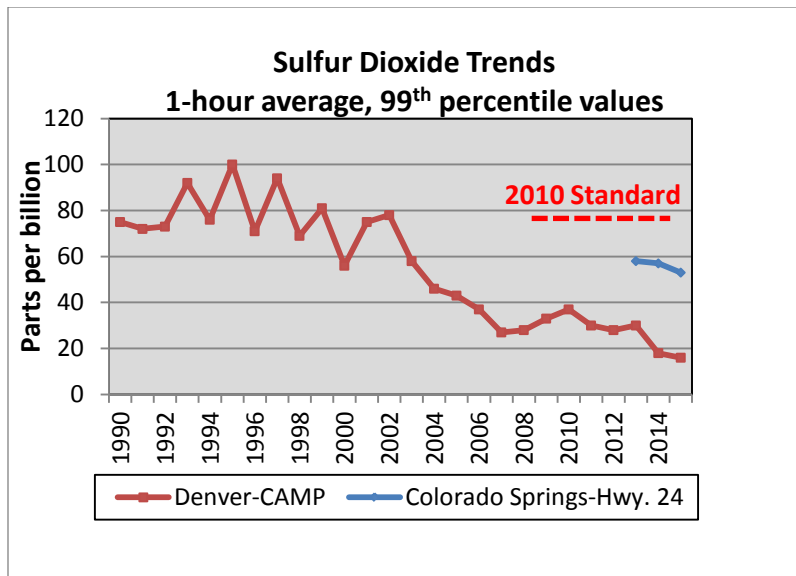
NO_x contributes to a wide range of environmental effects directly and, when combined with other precursors, to acid rain and ozone. Increased nitrogen in terrestrial and wetland systems can lead to changes in plant species composition and diversity. Nitrogen in lakes and streams can lead to eutrophication (a condition of excessive algae growth), and leads to a severe depletion of dissolved oxygen and increased levels of toxins harmful to aquatic life. NO_x can also contribute to visibility impairment.

Impacts in Colorado

The state monitors NO₂ at four sites in Colorado: downtown Denver's CAMP station; Welby just north of Denver; just south of downtown Denver near Interstate 25; and in north Denver near Pecos Street and Interstate 70. All sites show NO₂ values that are below the national ambient air quality standards. The federal land managers also monitor NO₂ in Colorado and report their data to the EPA's Air Quality System data base. These monitors also show levels below NO₂ standards.

Major air pollutants – sulfur dioxide

Sulfur dioxide (SO₂) is one of a group of highly reactive gases known as "oxides of sulfur," or sulfur oxides (SO_x). The largest sources of SO₂ emissions are from fossil fuel combustion at power plants and other industrial facilities. Smaller sources of SO₂ emissions include industrial processes, on- and off-road diesel vehicles, and the burning of high sulfur fuels by locomotives and non-road equipment. Furthermore, SO₂ is oxidized to form sulfate, in the form of sulfuric acid or ammonium sulfate. These compounds are major contributors to acid rain, as well as fine sulfate particles in the PM_{2.5} fraction, which degrade visibility and represent a human health hazard.



Health and Environmental Effects

High concentrations of sulfur dioxide can result in temporary breathing impairment for asthmatic children and adults who are active outdoors. Short-term exposures of asthmatic individuals to elevated sulfur dioxide levels during moderate activity may result in breathing difficulties that can be accompanied by symptoms such as wheezing, chest tightness, or shortness of breath. Other effects that have been associated with longer-term exposures to high concentrations of sulfur dioxide, in conjunction with high levels of particulate matter, include aggravation of existing cardiovascular disease, respiratory illness, and alterations in the lungs' defenses. The subgroups of the population that may be affected under these conditions include individuals with heart or lung disease, as well as the elderly and children.

Impacts in Colorado

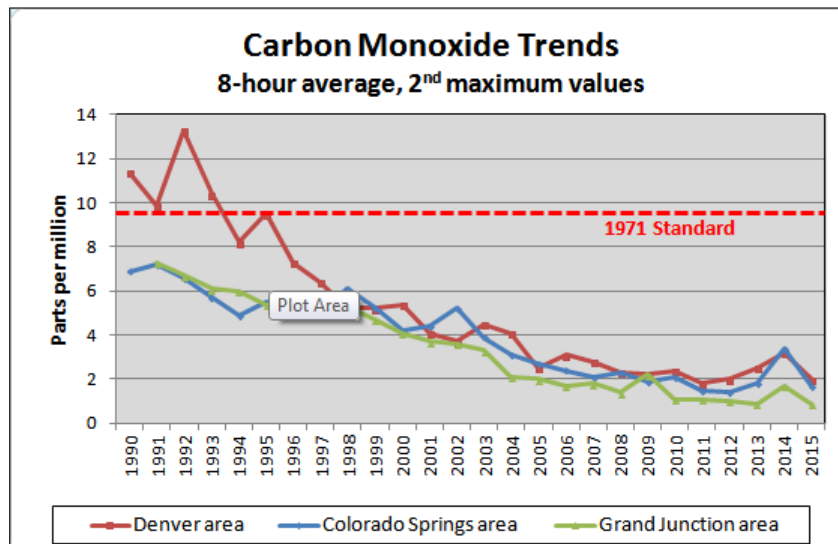
Colorado does not have a history of violating health standards for sulfur dioxide. However, the historical concern in Colorado with sulfur dioxide has been associated with acid deposition and its effects on mountain lakes and streams, as well as the formation of fine aerosols. In 2010, EPA issued a new, more stringent 1-hour sulfur dioxide national ambient air quality standard that has a shorter averaging period. Additional assessment of compliance with this standard is underway.

Historically, the site with the highest annual average of 1-hour average concentrations recorded by the Division monitors was 18.0 ppb in 1979 at the Denver CAMP monitor. Since 1990, the annual average at the Denver CAMP monitor has declined from a high in 1992 of 10.0 ppb to 3.1 ppb in 2014. Observed 1-hour SO₂ annual design values at the CAMP station declined from 148.8 ppb to 13.4 ppb during this same time period. The Highway 24 (Colorado Springs) site was outfitted with an SO₂ monitor in January of 2013. This site is below the standard with the 2013-2015 design value at 56 ppb. A meteorological tower has recently been installed at the site as well as another meteorological tower at the nearby Martin Drake Power Plant in an effort to obtain a better understanding of local weather phenomena, monitor siting, and 1-hour SO₂ levels.

In August 2015, the Commission approved a recommended designation of unclassified for locations near two coal fired power plants, one in Colorado Springs and another outside Fort Morgan. EPA has since approved these designations. Additional research and Commission action for these and other locations near the state's coal-fired power plants will occur in the coming years.

Major air pollutants - carbon monoxide

Carbon monoxide (CO) is a colorless and odorless gas formed when carbon compounds in fuel undergo incomplete combustion. The majority of CO emissions to ambient air originate from mobile sources (i.e., transportation), particularly in urban areas, where as much as 85% of all CO emissions may come from automobile exhaust. CO can cause harmful health effects by reducing oxygen delivery to the body's organs and tissues. High concentrations of CO generally occur in areas with heavy traffic congestion. In Colorado, peak CO concentrations typically occur during the colder months of the year when automotive CO emissions are highest and nighttime temperature inversions are more frequent.



Health and Environmental Effects

CO affects the central nervous system by depriving the body of oxygen and the health effects of CO vary with concentration. At exceedance levels, these effects range from fatigue in healthy people and chest pain in people with heart disease at lower concentrations to impaired vision and coordination, headaches, dizziness, confusion, and nausea at much higher levels.

Impacts in Colorado

Outdoor CO concentrations have dropped dramatically since the early 1970s due to national vehicle emission controls. This change is evident in both the concentrations measured and the number of monitors that have exceeded the level of the 8-hour standard. In 1975, 9 of 11 (81%) state-operated monitors exceeded the 8-hour standard of 9 ppm. In 1980, 13 of 17 (77%) state-operated monitors exceeded the 8-hour standard. Since 1996, no state-operated monitors have recorded a violation of the 8-hour standard. In 2014 the highest statewide second maximum 8-hour concentration was 1.8 ppm as recorded at the La Casa station. The maximum 1-hour concentration ever recorded at any of the state-operated monitors was a 79.0 ppm, which was recorded at the Denver CAMP monitor in 1968. In 2014, the second maximum 1-hour concentration recorded was 3.4 ppm as recorded at the Highway 24 (Colorado Springs) station, well below the 1-hour standard of 35 ppm. The 1-hour annual maximum concentrations have declined from more than twice the standard in the late 1960s to about one quarter of the standard today.

Indoor CO poisoning still occurs, especially when home heating furnaces malfunction. It is important for people to install and maintain CO detection monitors to prevent these tragic events.

Major air pollutants - lead

Lead is a metal found naturally in the environment as well as in manufactured products. The primary historical sources of lead air emissions have been from motor vehicles burning leaded gasoline, and certain industrial sources. Since the phase-out of leaded gasoline beginning in the 1970s, today's primary sources of lead air emissions are industrial metal processing, lead smelting and aviation gasoline.

In 2008 the EPA revised the national standard for lead from 1.5 micrograms per cubic meter to 0.15 micrograms per cubic meter. There is one lead monitor in Colorado at the La Casa site near Pecos Street and Interstate 70 in north Denver. The monitor shows lead levels well below the standard and will be discontinued in 2016.

Health and Environmental Effects

Depending on the level of exposure, lead can adversely affect the nervous system, kidney function, immune system, reproductive and developmental systems, and the cardiovascular system. Lead exposure also affects the oxygen carrying capacity of the blood. Lead exposure leads to neurological effects in children and cardiovascular effects such as high blood pressure in adults. Infants and young children are especially sensitive to even low levels of lead, which may contribute to behavioral problems and learning deficits.

Ecosystems near point sources of lead have demonstrated a wide range of adverse effects including losses in biodiversity, changes in community composition, decreased growth and reproductive rates in plants and animals, and neurological effects in vertebrates.

Impacts in Colorado

Since the phase-out of leaded gasoline, airborne lead levels monitored in Denver have decreased by more than 95 percent. Lead at the Denver monitoring site is now at or near the minimum levels of detection. A lead monitor was added at Centennial Airport in Arapahoe County in 2010 to meet new federal lead monitoring requirements at airports. Aviation fuel still contains lead. The monitor was removed in 2014 after showing low levels of detection.

Lead paint in older homes remains an issue. Though the Commission does not require the remediation of lead paint, the Division has excellent resources designed to minimize and prevent exposure to this dangerous metal. Please see the following website for additional information:

<https://www.colorado.gov/pacific/cdphe/leadpaint>

Major air pollutants - hazardous air pollutants

Hazardous air pollutants, also known as air toxics, are those pollutants that are known or suspected to cause cancer or other serious health effects. Examples include benzene, which is found in gasoline; perchloroethylene, which is emitted from some dry cleaning facilities; and methylene chloride, which is used as a solvent and paint stripper by a number of industries. Examples of other listed air toxics include dioxin, asbestos, toluene, and metals such as cadmium, mercury, chromium, and lead compounds.

While no ambient air quality standards have been set for air toxics, the EPA has published a list of 187 air toxics and has developed standards for specific industries. These standards are called the National Emission Standards for Hazardous Air Pollutants (NESHAPS). NESHAPS are commonly addressed through maximum achievable control technology (MACT) requirements.

MACT requirements are technology-based controls or practices for specific industries and are designed to reduce hazardous air pollutant emissions to the maximum achievable degree, taking into consideration the cost of reductions and other factors. After the EPA adopts a MACT standard at the federal level, the same standard is proposed for adoption at the state level by the Commission. Air toxics also are reduced through other efforts such as automobile inspection and maintenance, ozone reduction measures to reduce volatile organic chemicals, the Mercury-free Colorado Campaign, a diesel school bus emissions control retrofit program, and pollution prevention in industries and communities statewide.

Health and Environmental Effects

People that experience prolonged exposure to toxic air pollutants at significant concentrations may have an increased chance of experiencing serious health effects. These health effects can include cancer, damage to the immune system, as well as neurological, reproductive, developmental, respiratory and other health problems. Some toxic air pollutants such as mercury can deposit onto soils or surface waters, where they are taken up by plants and ingested by animals, and eventually accumulated up through the food chain. Like humans, animals may experience health problems if exposed to sufficient quantities of air toxics over time.

Impacts in Colorado

In general, studies have shown that air toxics levels are similar in urbanized areas across the nation. People are exposed to air toxics primarily through transportation, as motorists or passengers, or as residents who live near major highways or industries. Several air monitoring studies of air toxics in Colorado have been conducted, including in Denver, Grand Junction, Pueblo and Garfield County. Overall, these studies have found that air toxics levels are below EPA levels of concern, though locally higher levels may be found near sources, both in urban areas and rural areas. An example is for oil and gas development which is an industrial activity. Recent studies have shown that certain portions of the development, such as short-term fracking and flowback periods, can have higher emissions. Additional risk assessment studies are being performed on these data to assess potential health impacts.

For more information:

- [EPA National monitoring programs annual reports.](#)
- [CDPHE air toxics reports.](#)
- [Garfield County reports.](#)

Major air pollutants - greenhouse gases

Both natural and human emissions of greenhouse gases (GHGs) absorb the sun's heat and trap that heat in the atmosphere. As atmospheric concentrations of these gases increase, the Earth's climate is impacted. Actions taken by the Commission have helped to reduce GHG emissions. The Regional Haze State Implementation Plan (SIP), for example, incorporates significant reductions in GHG emissions from electrical generating units due to coal power plant retirement and/or repowering with natural gas. Also, the Commission's February 2014 oil and gas requirements will significantly reduce methane emissions from the sector, and are the first set of reduction strategies in the nation aimed at methane.

The Division developed a Greenhouse Gas Inventory for the State of Colorado (2014). The inventory shows data from all sectors in Colorado based on EPA's State Inventory Tool (SIT) Model and is available on the division's website at: [Colorado greenhouse gas reports](#). For the year 2020, Colorado's inventory projects carbon dioxide to make up approximately 74 percent of greenhouse gas emissions, methane to make up approximately 21 percent, with nitrous oxide and fluorinated gases contributing the balance (based on CO₂'s global warming potential).

The two largest sources of greenhouse gas emissions from human activities in Colorado are from burning fossil fuels for electricity and transportation. Other categories of greenhouse gas emissions in Colorado include industrial processes (such as the production of cement and steel), oil and gas exploration and development, agriculture, forestry, coal mining, other land use, and waste management including landfills.

Environmental Effects

Accumulation of greenhouse gases in the atmosphere leads to rising temperatures, shifting snow and rainfall patterns, and more extreme climate events, including floods, heat waves, and tropical storms. Glaciers, snowpack and sea ice are shrinking, oceans are rising, and droughts are longer and more intense in some areas. [EPA Climate Change Basics website](#).

Impacts in Colorado

A number of observed and projected climatic changes have been cited in Colorado and the Southwest by the EPA. [EPA Climate Change in the Southwest](#).

These changes include:

- Increasing temperatures and more frequent and severe droughts will likely worsen existing competition for water resources.
- Drought, wildfire, changes in species' geographic ranges, invasive species and pests will likely threaten native Southwest forests and ecosystems.
- Climate change may make it difficult for the Southwest's growing cities to attain air quality standards and meet energy and water demands.
- Climate change poses threats to the region's native peoples, infrastructure, agriculture, and recreational activities.

For additional information on the impacts of climate change in Colorado, see the Colorado Water Conservation Board's [Climate Change in Colorado report](#) and the Colorado Department of Local Affairs funded studies of the impact of climate change on extreme heat events in Front Range locations available on the divisions website at : [Local studies on impacts of Climate Change](#)

State and federal regulations require sources to report their GHG emissions. Federal greenhouse gas permitting requirements were established in 2011. Under Colorado's permitting program, sources may need to limit their emissions of GHG or utilize emissions control equipment known as Best Available Control Technology.

Other regulations that prevent greenhouse gas emissions include the federal national motor vehicle emissions and fuel mileage standards, newly promulgated GHG emissions standards for heavy duty diesel vehicles, and the oil and gas regulations adopted in February 2014 by the Commission. Colorado participates in a number of non-regulatory initiatives to reduce GHGs, including collaboration with the Colorado Energy Office (CEO)'s Greening Government Initiative to report and reduce energy use. Additionally CDPHE coordinates with CEO and the Colorado Water Conservation Board on climate issues.

Major air pollutants - regional haze

Regional haze is a term for the veil of white or brown haze that obstructs vistas in many parts of the country, including areas of Colorado. The haze is caused by fine particles including sulfates, carbon, soil particles, ammonium and nitrates. These particles are produced by emissions from power plants, industrial sources, motor vehicles, fires, agricultural activities, and windblown dust and dirt. The particles are carried by the wind, sometimes for hundreds or even thousands of miles in the case of transcontinental transport of pollutants.

Health and Environmental Effects

In our nation's scenic areas, the visual range has been reduced substantially by air pollution. In the West, visual range has decreased from an average of 140 miles to 35-90 miles, according to the EPA. Some of the pollutants which form haze also have been linked to serious health problems and environmental damage. Exposure to very small particles in the air has been linked with respiratory illness, decreased lung function, and even premature death. In addition, particles such as nitrates and sulfates contribute to acid rain formation. The deposition of reactive nitrogen compounds in the form of nitrate, ammonia, or ammonium can lead to over fertilization of alpine ecosystems such as those in Rocky Mountain National Park.

Impacts in Colorado

The federal Regional Haze Rule focuses on National Parks and Wilderness (Class I) Areas. Under the Clean Air Act, the "Class I" area designations were given to 158 areas in existence as of August 1977 that included national parks greater than 6,000 acres and all national wilderness areas and memorial parks greater than 5,000 acres. Colorado has 12 Class I areas. Haze reduction in these areas will have the complementary effect of improving visibility and air quality throughout Colorado, including reducing nitrogen deposition at Rocky Mountain National Park. Nitrogen deposition has impacted the park, including changes in the type and abundance of aquatic plant species, elevated levels of nitrate in surface waters, elevated levels of nitrogen in spruce tree chemistry, long-term accumulation of nitrogen in forest soils and a shift in alpine tundra plant communities favoring sedges and grasses over the natural wildflower flora.

The Commission adopted a Regional Haze SIP in January 2011 with revisions approved in November 2014. The EPA approved this plan in October 2012; approval of the revised plan is pending. The process included a detailed analysis of regional haze and its sources, and established emissions controls for major industrial sources of haze. In November of 2015, the Commission adopted a regional haze progress report that provided data and analysis on improving visibility conditions at Colorado's twelve Class I areas.

Major air pollutants - more information

[Air quality.](#)

Statewide monitoring data, current air quality, forecasted air quality.

[Ozone.](#)

Current status of ozone levels, health effects, nonattainment status and ozone reduction efforts.

[Greenhouse gas/climate change.](#)

Information on Colorado's greenhouse gas regulations, EPA rules, and Colorado's greenhouse gas inventory.

[Regional Haze.](#)

Colorado's federally-approved Regional Haze Plan, which represent status of regional haze, sources, and strategies that will reduce regional haze.

[Nitrogen deposition at Rocky Mountain National Park.](#)

Current status of nitrogen deposition and its impacts at the park including the planning documents that specify the reduction strategies in place.

[Pollutant standards and health effects.](#)

Federal and state air quality standards, health effects, areas affected in Colorado, control strategies.

Major initiatives

Ozone Reduction

The Denver Metropolitan and North Front Range nonattainment area is in the midst of a multi-year effort to reduce ground-level ozone levels to comply with federal ozone standards. The area was initially designated by the EPA as a "marginal" nonattainment area for the 75 parts per billion ozone national ambient air quality standard in 2012. However, the region did not attain the standard by the July 20, 2015 attainment deadline so EPA reclassified region as a "moderate" nonattainment area.

A revised SIP to reduce ozone levels for the Denver Metropolitan and North Front Range nonattainment area has been proposed to the Commission for consideration by the Division and the Regional Air Quality Council. The plan includes detailed technical analyses regarding the formation of ozone, future trends in ozone levels, strategies to reduce ozone, and other elements. Colorado must comply with the 75 parts per billion ozone standard by 2018; the SIP includes the measures deemed necessary to meet the deadline. The Commission will consider adoption of the plan in late 2016. The EPA also implemented a new ozone standard of 70 parts per billion in October 2015. The Regional Air Quality Council, the Division and the Commission will begin to study and evaluate options to comply with this lower standard beginning in 2017.

Clean Power Plan

The U.S. EPA in October 2015 published new rules designed to reduce carbon emissions from fossil fuel-fired power plants across the country. Known collectively as the Clean Power Plan, the rules are designed to reduce carbon emissions by the year 2030 and protect public health and the environment while maintaining an affordable, reliable energy system. The Clean Power Plan includes performance standards and emission guidelines for both new and existing electric generating units. EPA also adopted new source performance standards for new fossil fuel electric generating units.

In early February 2016, the U.S. Supreme Court issued a decision to stay the Clean Power Plan regulations pending judicial review in the U.S. Court of Appeals for the District of Columbia Circuit. Prior to the Clean Power Plan, Colorado had already taken a number of regulatory initiatives to reduce carbon pollution, including retiring or repowering coal-fired units, increasing renewable energy use and energy efficiency, and reducing energy demand. Colorado continues to explore options for reducing carbon emissions while the judicial review process plays out.

Colorado is working with stakeholders to productively use the time afforded by the stay and to take prudent steps to put Colorado in the best possible position pending the outcome of litigation. For more information see Colorado's [Clean Power Plan website](#).

Regional air quality

Areas of the state differ greatly from one another in landscape, weather, population, motor vehicle traffic, amount of industry and potential of wood smoke from residential fires, wildfires and controlled burns. This section of the report separates Colorado into eight regions to more clearly address each region's specific air quality conditions and activities.



- [Denver-Metro/North Front Range Region](#).
- [Eastern High Plains Region](#).
- [South Central Region](#).
- [Pikes Peak Region](#).
- [San Luis Valley Region](#).
- [Southwest Region](#).
- [Western Slope Region](#).
- [Central Mountains Region](#).

Regional air quality - Denver-Metro/North Front Range

The Denver-Metro/North Front Range Region includes Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, Jefferson, Larimer and Weld counties. It includes the largest population area of the state, with 2.8 million people living in the seven-county Denver-metro area and another half-million living in the northern Colorado area of Larimer and Weld counties (according to the U.S. Census Bureau as of 2010). This area includes Rocky Mountain National Park and several wilderness areas.

In the past, the Denver-metropolitan area violated health-based air quality standards for ozone, carbon monoxide and fine particles. In response, the Regional Air Quality Council, the Division and the Commission developed, adopted and implemented air quality improvement plans to reduce each of the pollutants. Fort Collins, Longmont and Greeley were nonattainment areas for carbon monoxide in the 1980s and early 1990s, but have met the federal standards since 1995. Air quality improvement plans have been implemented for each of these communities.

The region presently complies with all National Ambient Air Quality Standards, except for ozone. The area has been exceeding the EPA's most recent ozone standards since the early 2000s, and in 2007 was formally designated as a "nonattainment" area. This designation was re-affirmed in 2012 when the EPA designated the region as a "marginal" nonattainment area for the more stringent ozone standard adopted by EPA in 2008. Recently, the Denver Metro/North Front Range was "bumped-up" to a "moderate" nonattainment area classification for the 2008 ozone standard, which triggered the requirement to develop an updated ozone plan for consideration with the Commission in the fall of 2016.

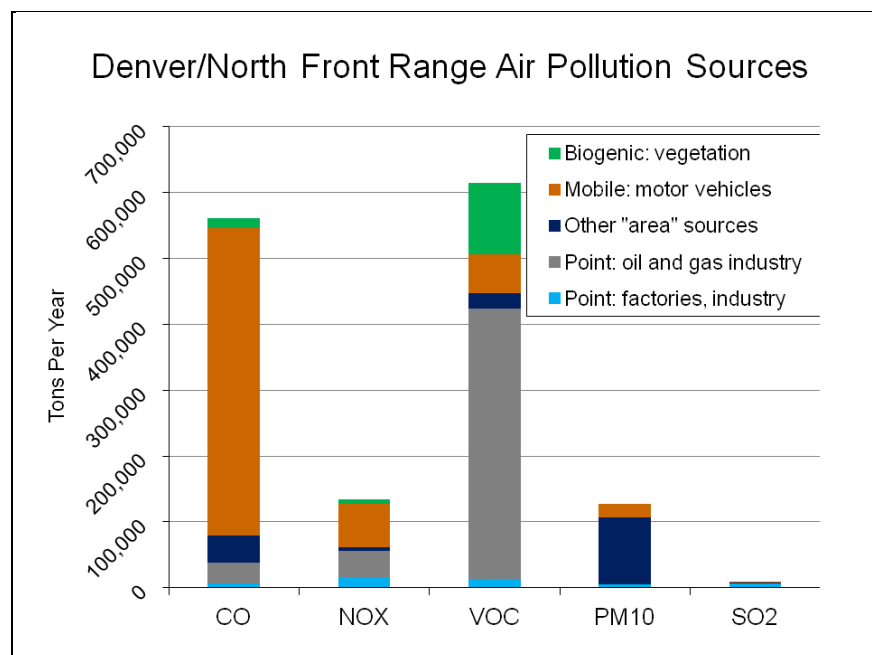
Rocky Mountain National Park has been impacted by nitrogen deposition, which is causing changes to the alpine plant and aquatic environments. A nitrogen reduction plan is in place and progress is being tracked by the National park Service, the Division, EPA and the Commission. For more information on this groundbreaking initiative see the [Rocky Mountain National Park Initiative website](#).

Air Pollution Sources

- Motor vehicles.
- Road dust.
- Oil and gas production.
- Large commercial breweries.
- Petroleum refining.
- Asphalt production.
- Cement manufacturing.
- Sand and gravel operations.
- Glass bottle manufacturing.
- Commercial seating manufacturing.
- Area-wide remediation at Rocky Mountain Arsenal.
- Coal and natural gas power plants.

Air Pollution Control Measures

- Automobile emissions inspection and maintenance program.
- Street sweeping.
- Controls on oil and gas production tanks, equipment and engines.
- Permitting program limiting emissions from industrial sources.
- Lime spray dryers to reduce sulfur oxide emissions from power plants.
- Baghouses to reduce particulate matter emissions from power plants.
- Non-selective catalytic reduction to reduce NOx at cement plants.
- At power plants, low NOx burners, fuel switching to natural gas and unit shutdowns.



Regional air quality - Eastern High Plains

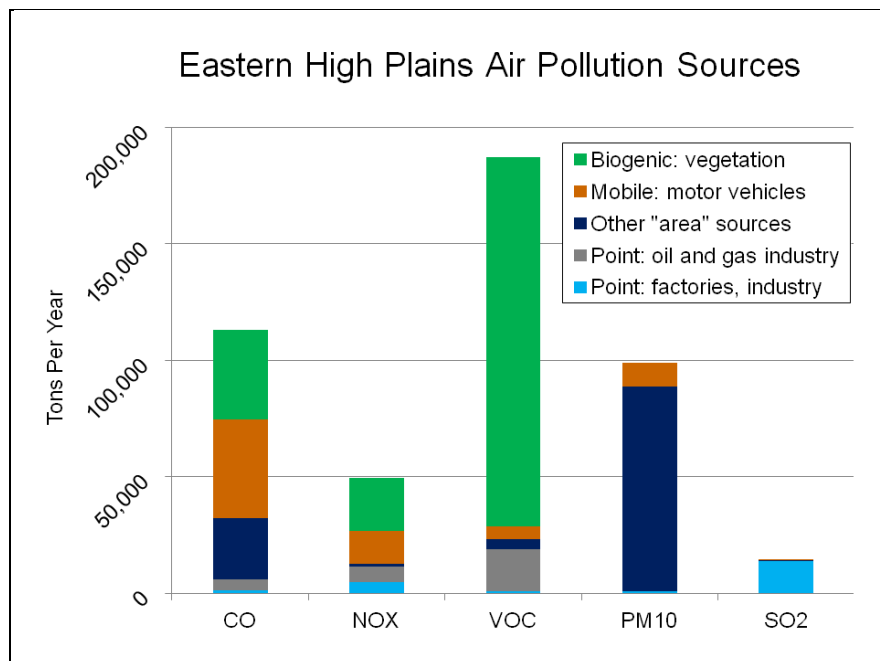
The Eastern High Plains region makes up 40 percent of Colorado's land area and encompasses the counties on the plains of eastern Colorado. The area is semi-arid and often windy. The area's population is approximately 157,000 according to 2010 U.S. Census Bureau estimates. Its major population centers have developed around farming, ranching and trade centers such as Sterling, Fort Morgan, Limon, La Junta and Lamar. The agricultural base includes both irrigated and dryland farming. All of the area complies with federal air quality standards.

Air Pollution Sources

- Motor vehicles.
- Windblown dust.
- Odors from confined animal feeding operations.
- Oil and gas production.
- Pawnee Power Plant near Brush.
- Western Sugar beet sugar processing in Fort Morgan.
- Cargill Meat packing plant in Fort Morgan.

Air Pollution Control Measures

- Lamar revised particulate matter control plan, which includes dust control measures for the area, and was approved by EPA in June 2016.
- State odor control regulation for hog farms.
- Statewide oil and gas emission controls.
- Scrubbers, baghouses, dust collectors and area dust suppression at Western Sugar.
- Lime spray dryer, low NOx burners, and selective catalytic reduction at Pawnee Power Plant.
- Low NOx burners, packed scrubber and flare device, along with other permit conditions to limit emissions at the Cargill meat packing plant.



Regional air quality - South Central

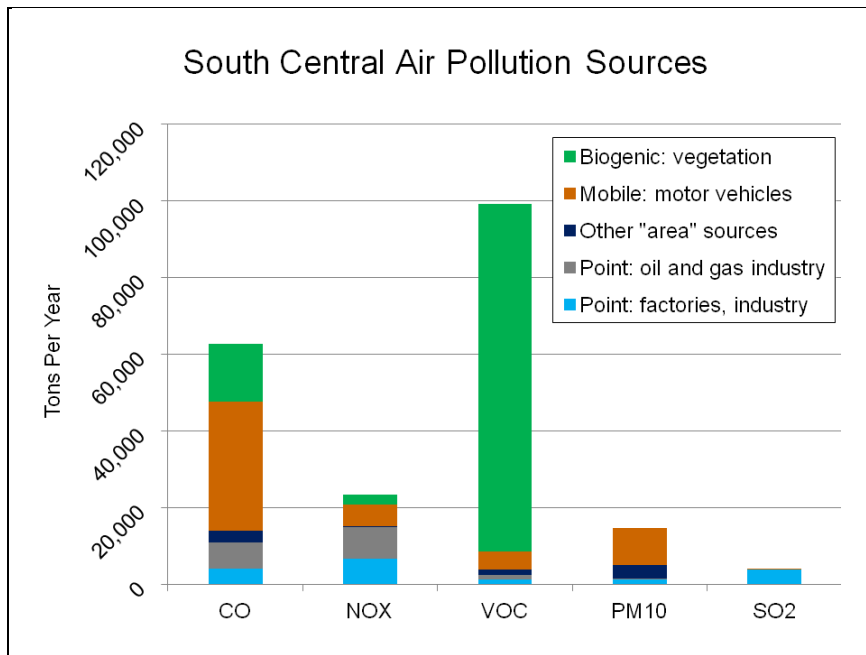
The South Central Region is comprised of Pueblo, Huerfano, Las Animas and Custer counties. Its population is approximately 184,800 according to 2010 U.S. Census Bureau estimates. Urban centers include Pueblo, Trinidad and Walsenburg. The region has rolling semiarid plains to the east and is mountainous to the west. All of the area complies with federal air quality standards.

Air Pollution Sources

- Motor vehicles.
- Fugitive dust.
- The Comanche Power Plant near Pueblo.
- EVRAZ Rocky Mountain Steel Mills in Pueblo.
- GCC Rio Grande Cement Plant in Pueblo.
- Oil and gas production.
- Large natural gas compressor stations in Las Animas County.

Air Pollution Control Measures

- Local dust control plans.
- Selective catalytic reduction, low NO_x burners, lime spray dryers and activated carbon mercury controls at Comanche Power Plant to reduce NO_x, SO₂ and mercury emissions.
- Compliance actions, monitoring and mercury reduction program at EVRAZ Rocky Mountain Steel Mills.
- Statewide oil and gas emission controls.
- VOC controls on natural gas compressor stations.



Regional air quality - Pikes Peak

The Pikes Peak Region includes El Paso and Teller counties. The area has a population of approximately 626,200 according to 2010 U.S. Census Bureau estimates. Eastern El Paso County is rural prairie, while the western part of the region is mountainous. All of the area complies with federal air quality standards.

Air Pollution Sources

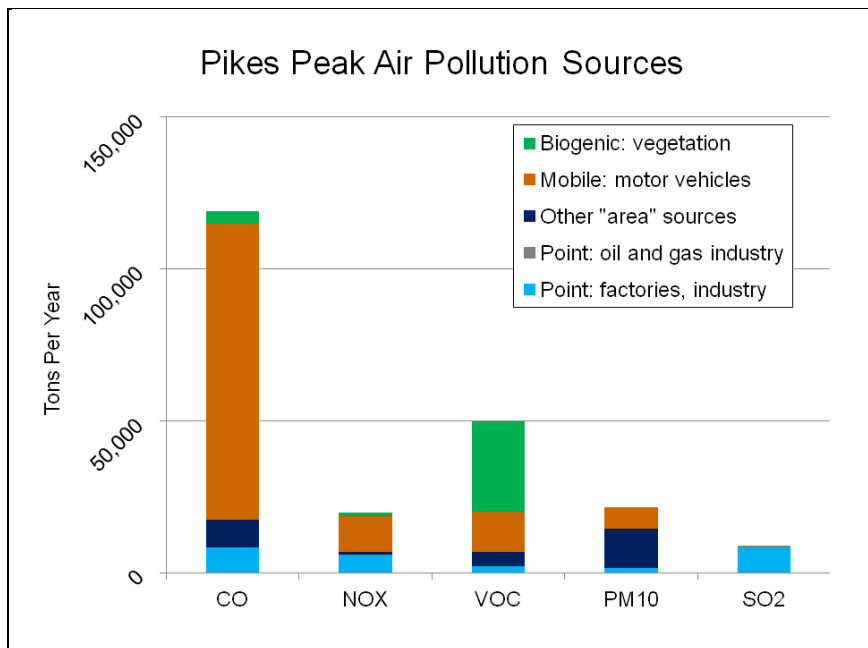
As in other urbanized areas in Colorado, pollutants in the Pikes Peak Region originate primarily from stationary and mobile sources.

- Motor vehicles.
- Road dust.
- Area dust from construction activities.
- The Drake and Nixon power plants and Fountain Valley Electric Generating Station.
- Oil and gas production.
- Sand and gravel operations.

Air Pollution Control Measures

- Street sweeping.
- Dust control plans.
- Lime spray dryer (or similar controls) and low NO_x burners at power plants to control SO₂ and NO_x emissions.
- Statewide oil and gas emission controls.

Assessment of the Drake power plant for its impact on the 1-hour SO₂ standard is ongoing. Modeling and monitoring of the plant's impact on SO₂ concentrations will continue into 2017.



Regional air quality - San Luis Valley

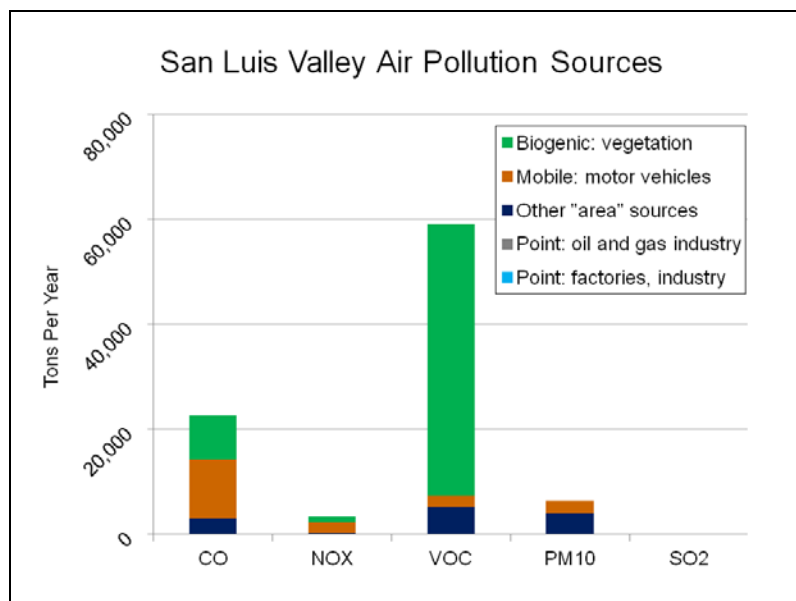
Colorado's San Luis Valley Region is in the south central portion of Colorado and includes a broad alpine valley situated between the Sangre de Cristo Mountains on the northeast and the San Juan Mountains of the Continental Divide to the west. The valley is some 71 miles wide and 122 miles long, extending south into New Mexico. The average elevation is 7,500 feet. Principal towns include Alamosa, Monte Vista and Del Norte. The population is about 45,100 according to 2010 U.S. Census Bureau estimates. Agriculture and tourism are the primary industries. The valley is semiarid and croplands of potatoes, head lettuce and barley are typically irrigated. The valley is home to Great Sand Dunes National Park. The air quality planning region consists of Saguache, Rio Grande, Alamosa, Conejos and Costilla counties. All of the area complies with federal air quality standards.

Air Pollution Sources

- Blowing dust.
- Oil and gas production.
- Motor vehicles.

Air Pollution Control Measures

- Alamosa Natural Events Action Plan for windblown dust mitigation, which includes elements such as:
 - Blowing dust advisories and forecasting.
 - Public outreach on dust mitigation.
 - Dust control measures, such as street sweeping, curtailing construction activities that disturb soil, applying water to disturbed soils, planting vegetation and wind breaks, reducing or postponing tilling and plowing.
 - Statewide oil and gas emission controls.
- Regulatory dust control measures included in supporting documentation approved by EPA on multiple occasions (under exceptional events).



Regional air quality - Southwest

The Southwest Region includes the Four Corners area of Montezuma, La Plata, Archuleta and San Juan counties. The population of this region is about 89,800, according to 2010 U.S. Census Bureau estimates. The landscape includes mountains, plateaus, high valleys and canyons. Durango and Cortez are the largest towns, while lands of the Southern Ute and Ute Mountain Ute tribes make up large parts of this region. The region is home to Mesa Verde National Park, and tourism and agriculture are dominant economic activities. All of the area complies with federal air quality standards.

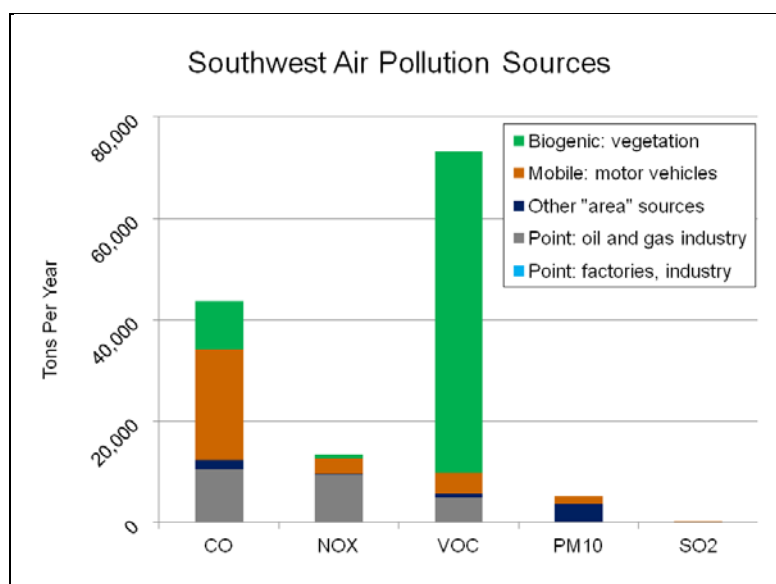
Air Pollution Sources

- Motor vehicles.
- Natural gas processing and transmission.
- Two coal-fired power plants in New Mexico.
- Gas field development in Colorado, Southern Ute Indian Reservation, and New Mexico.
- Wildfires.
- Durango & Silverton coal-fired steam locomotive tourist train.

Air Pollution Control Measures

The main air pollution control measures in this region include:

- Statewide oil and gas emission controls.
- Smoke management program.
- Durango Train Smoke Task Force.
- Tribal permitting and control of emission sources.
- Emissions reductions at New Mexico power plants.
- Particulate matter control plan for Pagosa Springs includes: street sweeping and sanding controls, use of chemical deicers, and paving of dirt roads.



Regional air quality - Western Slope

The Western Slope Region includes nine counties on the far western border of Colorado. A mix of mountains on the east, and mesas, plateaus, valleys and canyons to the west form the landscape of this region. Grand Junction is the largest urban area, and other cities include Telluride, Montrose, Delta, Rifle, Glenwood Springs, Meeker, Rangely and Craig. The population of this region is about 309,700, according to the 2010 U.S. Census Bureau estimates. Primary industries include ranching, agriculture, mining, energy development and tourism. Dinosaur and Colorado National Monuments are located in this region.

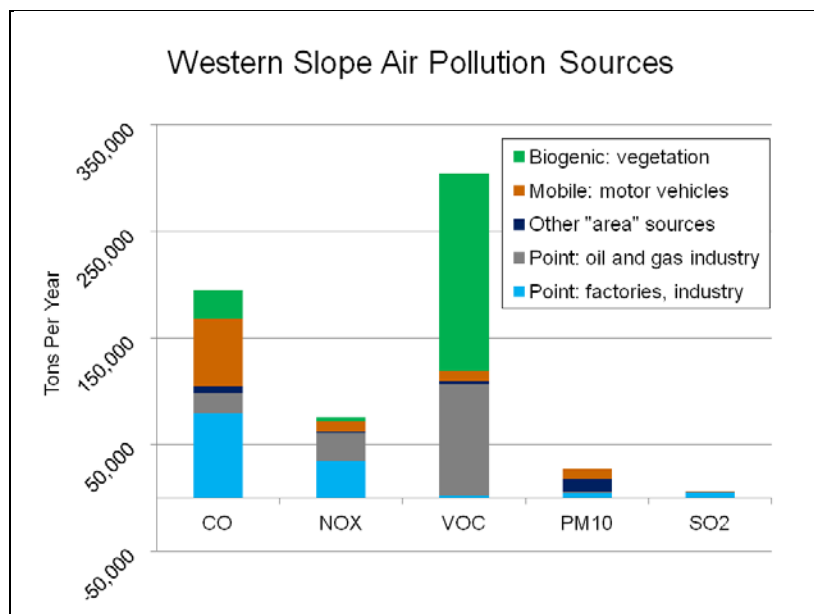
All of the Western Slope Region presently complies with federal air quality standards. However, elevated ozone levels were recorded in the Rangely area during the winters of 2010/11 and 2012/13 which resulted in violations of the 2008 ozone standard. The area has not experienced such elevated ozone concentrations since, so a "nonattainment designation" is not appropriate for Rangely. Grand Junction area frequently has experienced elevated wintertime PM2.5 concentrations, though area has not violated the federal standard.

Air Pollution Sources

- Motor vehicles.
- Oil and gas development.
- Nucla and Craig coal-fired power plants.
- Coal mines in Delta, Mesa, Moffat, and Montrose counties.
- Sand and gravel operations.
- Windblown dust.
- Wildfires.
- Prescribed fire.

Air Pollution Control Measures

- Installation of and selective non-catalytic reduction & selective catalytic reduction NOx controls at the Craig power plant, Units 2 and 3 by 2018
- Statewide controls on oil and gas production.
- Smoke Management Program for prescribed fire.
- Fugitive dust control plans.
- Particulate matter control plan for Telluride includes: wood-burning control measures, street sweeping and sanding controls, use of chemical deicers, and paving of dirt roads.
- For Rangely, oil and gas emissions control measures are being developed for production areas across the Utah state line, which are the major influence on elevated ozone concentrations in the area.



Regional air quality - Central Mountains

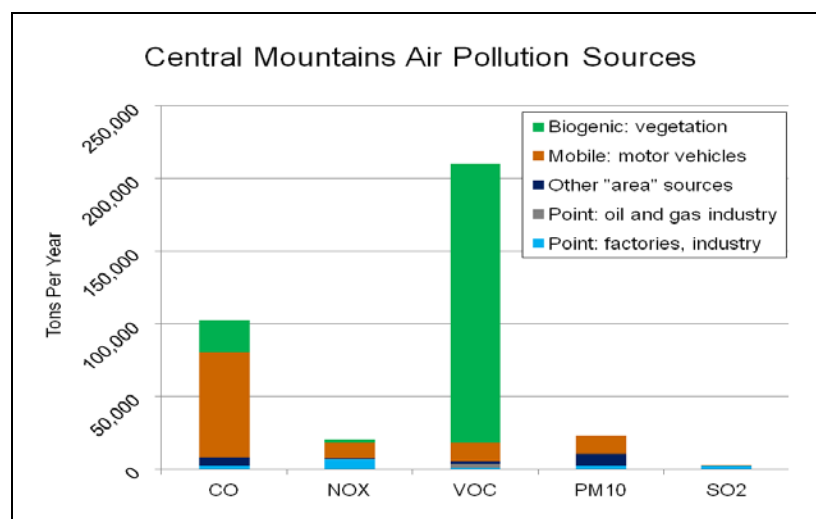
The Central Mountains Region consists of 15 counties in the central area of the state. The Continental Divide passes through much of this region. Mountains and mountain valleys are the dominant landscape. Leadville, Steamboat Springs, Cañon City, Salida, Buena Vista and Aspen represent the larger communities. The population of this region is about 256,800, according to U.S. Census Bureau estimates. Skiing, tourism, ranching, mining and correctional facilities are the primary industries. Black Canyon of the Gunnison National Park is located in this region. All of the area complies with federal air quality standards.

Air Pollution Sources

- Motor vehicles.
- Holcim Portland cement plant in Fremont County.
- Sand and gravel operations.
- Hayden power plant.
- Climax Molybdenum Mine.
- Oxbow and Mountain Coal mining facilities in Gunnison County.
- Wildfires.
- Controlled burning.

Air Pollution Control Measures

- Power plants: dry limestone scrubbers to reduce SO₂ emissions, fabric filter baghouse to control particulate emissions, selective catalytic reduction at the Hayden plant by 2018 to control NO_x emissions, shutdown of the Black Hills Clark Station in 2013.
- Holcim Portland Cement plant: selective non-catalytic reduction emissions for NO_x reduction, wet limestone scrubbers for SO₂ reduction by 2018.
- Smoke management program for large controlled burns.
- Particulate matter control plans for Aspen, Cañon City and Steamboat Springs to control particulate matter through woodburning controls in each town, street sanding and sweeping controls in Aspen and Steamboat Springs, and traffic reduction measures in Aspen. Any industries located in these cities now or in the future must also comply with emission controls as part of state regulations.



Air quality data

A variety of air quality data is available to the public online.

[Air quality monitoring, modeling and data.](#)

The Division's Technical Services Program website provides a variety of information related to air quality monitoring, forecasting, reports, modeling and emission inventories. All real-time air monitoring data are posted on an hourly basis from air monitoring sites across the state. Based on these data and predicted meteorology, air quality forecasts, alerts and advisories are posted for public notification. A variety of reports can be found as well as modeling information and information related to emissions of different pollutants in each county.

[Annual Air Quality Data Report.](#)

The Annual Air Quality Data Report provides a handy reference to the general public on air quality trends across the state and provides information on the different pollutants monitored and their potential health effects. This report is often used as a first step for data requests by the public or researchers looking to get more detailed information.

Summary of regulations

The following is a summary of the Commission's air quality regulations. For on-line access to complete regulations please see the [Air Quality Control Commission regulations website.](#)

Procedural Rules

The rules that the Commission follows for its regular monthly meetings, public hearings, rulemaking hearings and adjudicatory hearings.

Air Quality Standards Regulation

This regulation establishes ambient air quality standards for the state of Colorado and dictates monitoring procedures and data handling protocols. It also defines nonattainment area boundaries for locations in the state which historically have violated federal and state air quality standards. In addition, the regulation contains the state's urban visibility standard and sets emission budgets for nonattainment areas.

State Implementation Plan Specific Regulation

This regulation defines specific requirements concerning air quality control strategies and contingency measures for nonattainment areas in the state.

Particles, Smoke, Carbon Monoxide and Sulfur Oxides

Regulation Number 1 sets forth emission limitations, equipment requirements and work practices (abatement and control measures) intended to control the emissions of particles, smoke and sulfur oxides from new and existing stationary sources. Control measures specified in this regulation are designed to limit emissions into the atmosphere and thereby minimize the ambient concentrations of particles and sulfur oxides.

Odor Control

Regulation Number 2 sets standards for allowable odor contaminants for different land-use areas in the state and outlines control measures that can be taken to bring violators into compliance.

Air Pollution Emission Notices and Permits

Regulation Number 3 requires air pollution sources to file Air Pollution Emission Notices. It also requires that new or modified sources of air pollution - with certain exemptions - obtain preconstruction permits. Very large facilities also are required to obtain operating permits.

Woodburning Controls

Regulation Number 4 requires new stove and fireplace inserts to meet federal certification in specified areas of the state.

New Source Performance Standards

Regulation Number 6 sets standards of performance for specific new stationary sources in Colorado. The regulation is designed to bring new sources into compliance with the U.S. Environmental Protection Agency's New Source Performance Standards. In addition, the regulation sets standards for new industries that are unique to Colorado for which the EPA has not yet set standards.

Volatile Organic Compounds Control

Regulation Number 7 controls the emissions of volatile organic compounds, primarily in the Denver-metro area. It sets standards and mandates controls for specific types of volatile organic compound sources.

Hazardous Air Pollutants Control

Regulation Number 8 sets forth specific work practices, emission control requirements and standards for hazardous air pollutants and asbestos.

Open Burning, Prescribed Fire and Permitting

Regulation Number 9 applies to all open burning activities throughout the state to control smoke and emissions from such fires. The regulation sets forth requirements for permitting including prescribed fires, controlled burns and significant users of prescribed fires.

Transportation Conformity

Regulation Number 10 defines the criteria the Commission uses to evaluate the consistency between state air quality standards/objectives, and transportation planning and major construction activities across the state, as defined in state implementation plans.

Motor Vehicle Inspection Program

Regulation Number 11 requires automobile emission inspection and maintenance programs to be implemented in specified areas of the state for gasoline-powered on-road vehicles. These programs apply to businesses, industry and the general public.

Diesel Vehicle Inspection Program

Regulation Number 12 defines the state's diesel-powered vehicle emission inspection and maintenance program for on-road vehicles.

Chlorofluorocarbons

Regulation Number 15 identifies the requirements to control emissions of ozone-depleting compounds from both stationary and mobile sources.

Street Sanding and Sweeping

Regulation Number 16 sets specification standards for street sanding material and street sweeping practices in the Automobile Inspection and Readjustment program area, and the Denver- metro fine particle nonattainment area.

Acid Rain Control

Regulation Number 18 sets forth the requirement for implementing the state's acid rain program. This program is adopted by reference from the federal program found in 40 C.F.R., Part 72 as in effect on Jan. 6, 1994.

Lead Based Paint

Regulation Number 19 defines the requirements for certifying lead abatement professionals and work practice measures.

Stationary source permit information

The following summarizes the number of permits issued and the hours billed by the Air Pollution Control Division for Construction permits and Title V permits July 2015 - June 2016.

Actions	Construction Permits	Title V Permits
Total number of permits issued	2,893 construction permits	43 permit actions ¹
Total number of hours billed for permits	25,355 hours	6822.26 hours ²
The average number of hours billed per permit	8.8 hours per permit	158.66 hours per permit action ³
The number of general permits issued	1,757 general permits	None

¹ Number of permit actions issued and includes all permit types: Initial, Renewal, Significant, Minor, and Administrative. Some permit actions are combined (e.g. Minor Mod issued along with Renewal), thus the actual number of permit issuances will be lower than this amount.

² This represents the total number of hours billed during this time period. T5 permits are billed on a quarterly basis, thus the hours may not be associated with a permit issued during this time period, or may include time billed for hours worked outside the time period.

³ Total hours billed divided by total number of permits issued.

Enforcement report

The following summarizes enforcement actions of the Air Pollution Control Division. A full enforcement report for stationary sources of air pollution in Colorado is available at: [Stationary sources enforcement action reports](#).

Enforcement Summary July 2015 - June 2016

Actions	Stationary Sources	Asbestos Unit	CFC Unit	Lead Unit
Warning Letters	43	0	0	0
Compliance Advisories	151	n/a	n/a	n/a
Notices of Violation	7	45	0	0
Notices of Noncompliance (schools only)	n/a	47	0	n/a
Compliance Orders	2	0	0	0
Compliance Orders on Consent	35	0	0	0
Early Settlement Agreements	28	43	0	0
AQCC Hearings	2	0	0	0

Throughout 2016, the Commission heard an appeal of a Division enforcement action against two ethanol production facilities. After months of testimony and numerous hearings the Commission, upheld the Division's compliance orders which require the operators of the facilities to revise the permits, perform emissions testing and pay non-compliance penalties. The Commission's orders have been appealed by the sources to the Logan County District Court.

Glossary of Terms

Compliance Advisory (CA): The Division issues these to provide timely notice to a facility of apparent violations found during an inspection. The Division may or may not initiate a formal enforcement action, depending on the type of violation and the response of the facility.

Compliance Order (CO): If the Division determines that a violation or noncompliance did occur after a notice of violation conference, it may issue a compliance order. The order includes the final determinations of the Division regarding the violation or noncompliance, a summary of the proceedings at the notice of violation conference, and an evaluation of the evidence considered by the Division in reaching its final determination of law.

Compliance Order on Consent (COC): A settlement agreement or express terms, mutually agreed upon in writing, between the recipient of an informal notice of noncompliance, notice of violation, or compliance order and the Division, resolving the discovered noncompliance issues.

Early Settlement Agreement (ESA): The settlement document utilized by the Division and Source to resolve certain informally or formally initiated enforcement actions.

Notice of Noncompliance (NON): Issued to a school and requires the school to take certain steps to come into compliance. If the school comes into compliance within the stated time period, the Division does not require the school to pay a civil penalty.

Notice of Violation (NOV): Issued by the Division to provide specific notice to a company of the provisions alleged to have been violated, and the Division's factual basis and legal conclusions for the allegations.

Warning Letter: A written notification to a source that the Division has documented a violation that further recurrence could result in enforcement action being taken, but that no further enforcement action will result directly from the instant violation.

Roles of government and the public

Protecting air quality is a cooperative effort among many parties. Government agencies are responsible for assuring that air quality meets health and environmental standards. The public has an important role through lifestyle habits, consumer choices and energy usage.

Find out more from the following fact sheet: [Roles of government and the public](#).