



2016 Data

Air Quality Monitoring Update

Network Overview

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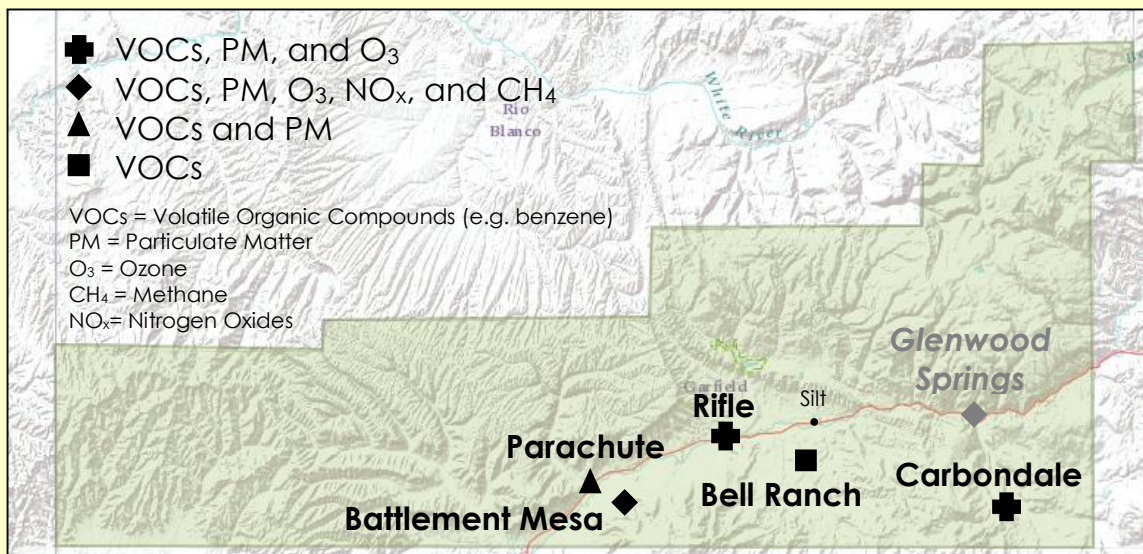
Garfield County Public Health operates an extensive air quality monitoring network designed to assess air quality in our county. Because clean air contributes to good health and a high quality of life, Garfield County is committed to a long-term air quality monitoring program.

Current air quality monitoring efforts include long-term monitoring sites in Parachute, Rifle, Carbondale and a rural location about 4 miles south of Silt. Additionally, beginning in March 2016, the County's mobile monitoring station returned to the Battlement Mesa location after a year in Glenwood Springs. This air quality monitoring update provides a brief summary of data collected through 2016. Key findings include:

- Garfield County did not violate any national air quality standards
- Air quality has continued to improve in recent years

While the current state of air quality in our county is good, Garfield County continues monitoring to better characterize what's in the air and help understand where it's coming from. Of particular concern are potential effects related to energy development, vehicle emissions, and population growth.

Visit our website at www.garfield-county.com/air-quality to learn more about what the County is doing and what YOU can do to protect and improve our air quality.



Garfield County Air Quality Monitoring Network Site Locations in 2016

What We're Monitoring

The 2016 air quality monitoring network in Garfield County consisted of five monitoring sites, at locations shown on the map on Page 1. Parameters monitored include:

- **Meteorology**
Wind speed, wind direction, temperature, relative humidity, and precipitation are collected along with air quality parameters to better understand the local conditions and transport of air pollutants.
- **Criteria pollutants**
 - **Ozone (O₃)**
 - **Nitrogen dioxide (NO₂)**
 - **Particulate matter (PM)**

Levels of criteria pollutants are regulated by the Environmental Protection Agency (EPA) and subject to National Ambient Air Quality Standards (NAAQS).
- **Volatile organic compounds (VOCs)**
This group includes hazardous air pollutants (HAPs). VOCs are monitored for a variety of purposes, including health effects, ozone formation potential, and identification of pollutant sources.



Anna Cochran, field technician for Garfield County Environmental Health, checks one of the county's particulate matter monitors in downtown Rifle.

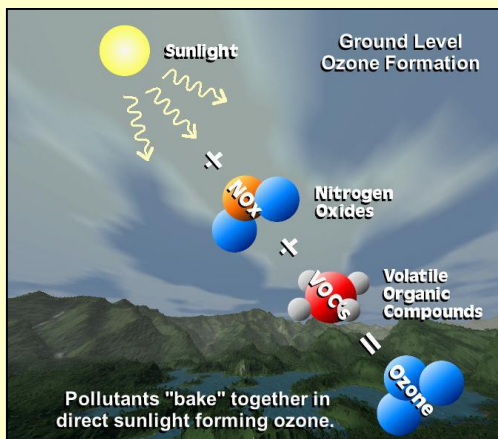


Image source: NASA.

Ozone

Ozone (O₃) is a pollutant formed through chemical reactions from the interaction of oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight. Ozone occurs naturally at ground-level in low concentrations, but prolonged exposure to elevated concentrations can irritate the lungs and cause lung tissue damage. Ground level ozone can also have harmful effects on sensitive vegetation and ecosystems.

Nitrogen Oxides

Nitrogen dioxide (NO₂) and nitric oxide (NO) are the primary components of a group of gasses referred to as nitrogen oxides (NO_x). Although only NO₂ is considered a criteria pollutant, Garfield County monitors levels of NO, NO₂, and the total of all nitrogen oxides (NO_x) in the air. Nitrogen oxides emissions are primarily related to fuel combustion, especially motor vehicles and industrial sources. Exposure to elevated NO₂ concentrations can cause adverse respiratory effects. Additionally, NO_x contributes to both ozone and particulate matter (PM) formation.

Particulate Matter

Particulate matter is made up of solid particles and liquid droplets that are small enough to be inhaled. Particulate matter is measured according to size, where:

- **PM_{2.5}** refers to particles less than 2.5 microns in diameter. These particles pose the greatest health risk.
- **PM₁₀** refers to particles less than 10 microns in diameter. These and larger sized particles can often be removed from the lungs through coughing.

Particulate matter has the potential to cause adverse respiratory and cardiovascular effects, especially when it becomes lodged deep in the lungs.

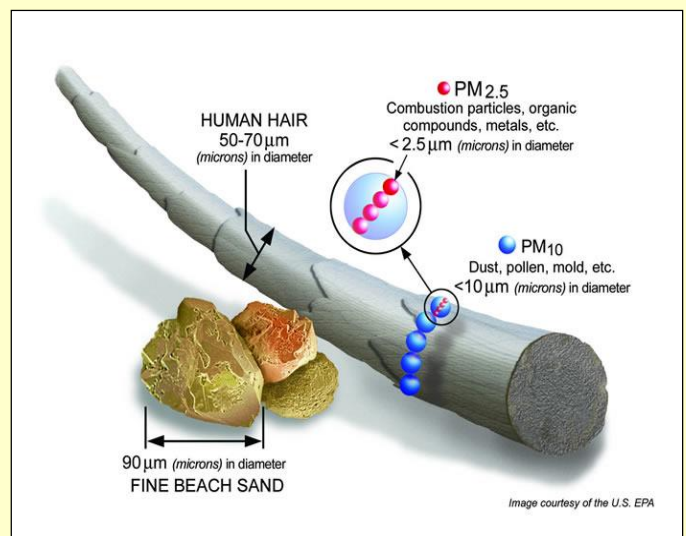


Image courtesy of the U.S. EPA



VOC monitoring in Garfield County includes **Hazardous Air Pollutants (HAPs)** such as the BTEX compounds (Benzene, Toluene, Ethylbenzene and Xylenes)

Volatile Organic Compounds

Volatile organic compounds (VOCs) are typically in gas form and are carbon and hydrogen-based. VOCs do not have set regulatory thresholds. Over **90 compounds** are measured at our monitoring sites every six days as well as a continuous VOC monitor in Battlement Mesa. Those monitored in Garfield County include:

- 21 compounds that are considered hazardous air pollutants (HAPs) which are known or believed to cause human health effects
- A number of compounds related to oil and gas development
- 69 VOCs which are not considered hazardous to human health (e.g. ethane and propane).
- Methane, which is a potent greenhouse gas.

There are a variety of sources of VOCs. They include emissions from petroleum related activities such as natural gas development and vehicle fueling, fuel combustion from vehicles and industry, manufacturing, and natural sources such as emissions from trees and other vegetation.

In 2016, researchers from Colorado State University also completed a study examining air emissions from natural gas operations in Garfield County.

Air Quality Index – 2016 Levels

The EPA developed the Air Quality Index (AQI) to provide real-time health advisories and cautionary statements during periods of poor air quality. AQI health advisory levels are color-coded and based on regulatory standards for criteria pollutants, which have set thresholds under the Clean Air Act.

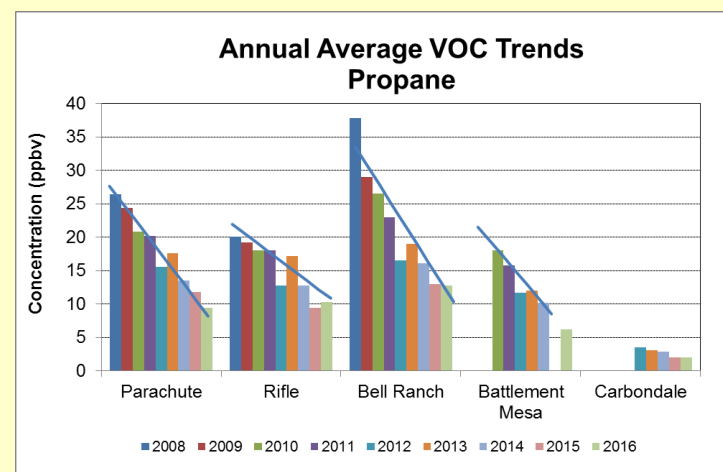
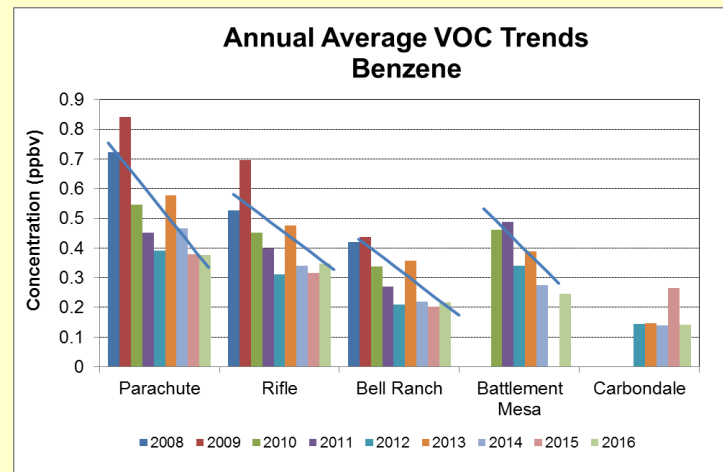
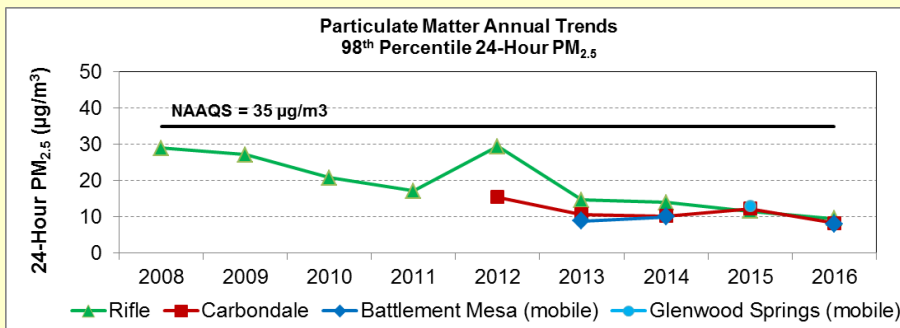
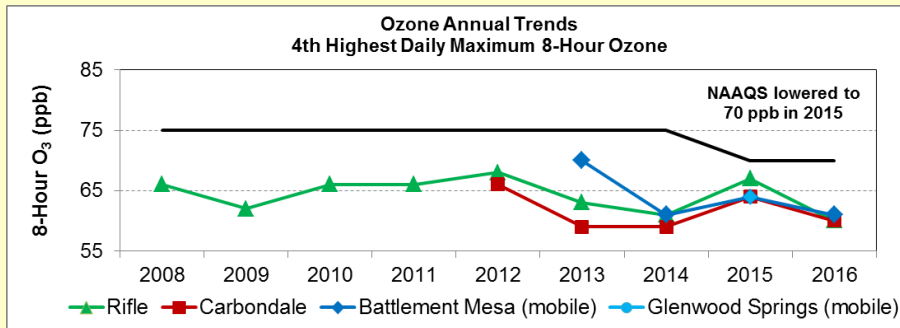
The below table summarizes the number of days that Garfield County spent in each AQI category in 2016 for ozone, particulate matter, and nitrogen dioxide. This includes data collected at the Rifle site, the mobile monitor in Battlement Mesa, and the Carbondale site. Real-time AQI values are also available on the Garfield County website. In 2016, Garfield County spent a large majority of days in the “good” category for all three pollutants. A small percentage of days were considered “moderate” for ozone and one day for particulate matter, but no days were recorded in the “unhealthy” category, even for sensitive groups.

Real-time AQI Values are available on the Garfield County Air Quality website
www.garfield-county.com/air-quality

Air Quality	Cautionary Statements	Number of Days		
		Ozone (O ₃)	Particulate Matter (PM _{2.5})	Nitrogen Dioxide (NO ₂)
Good	None	323	365	353
Moderate	People who are unusually sensitive to air pollution should consider limiting prolonged or heavy exertion outdoors.	43	1	0
Unhealthy for Sensitive Groups	Active children and adults, and people with lung disease, such as asthma, should reduce prolonged or heavy exertion outdoors.	0	0	0
Unhealthy	Active children and adults, and people with lung disease, such as asthma, should reduce prolonged or heavy exertion outdoors. Everyone else, especially children, should reduce prolonged or heavy exertion outdoors.	0	0	0
Missing	N/A	0	0	13

Daily air quality health advisory levels, per EPA's Air Quality Index (AQI) as measured in 2016 in Garfield County.

Air Quality Pollutant Levels and Trends



The current Garfield County air quality monitoring network began in 2008. With several years of data, we are able to determine trends, and whether air quality is improving or degrading over time.

Since 2008, all criteria pollutants measured in Garfield County remained below the National Ambient Air Quality Standards (NAAQS) limits, as defined by the EPA. Plots to the left depict trends since 2008 for 8-hour O₃ and 24-hour PM_{2.5} along with the NAAQS limits.

Comprehensive annual air quality monitoring data summary reports are available at www.garfield-county.com/air-quality

Annual average VOC concentrations in Garfield County have generally decreased from levels observed in 2008 when monitoring began. Monitoring results indicate that:

- Most Hazardous Air Pollutants (HAPS), such as benzene, have measured statistically significant decreasing annual average concentration trends at sites that have been in place more than five years. The plot to the left depicts decreasing benzene trends measured for the 2008-2016 period. At the Rifle site, the annual average benzene concentration is higher due to several samples collected during the first quarter.
- Only one HAP, styrene (not shown), had increasing concentration trends in recent years, though not at concerning levels. While the source is unknown, styrene is associated with the production of plastics. It is believed to be transported to the area, as there are no known large styrene sources in Garfield County.
- Many of the VOCs measured at the Garfield County sites are light alkanes, such as propane, which are associated with natural gas development. Light alkanes are not considered hazardous air pollutants, but may contribute to ozone formation and odor issues. Light alkanes have also shown decreasing trends, as illustrated by propane concentrations in the plot to the left.

The mobile air monitoring unit, currently located in Battlement Mesa, was moved to Glenwood Springs during 2015 to characterize air quality there.

New in 2017

In 2017, Garfield County Public Health continues our long term monitoring efforts, with the following changes:

- The Rifle air monitoring site moved from the Henry Building to the Rifle Branch Library in January 2017 due to the County's sale of the Henry Building. Public Health staff are collaborating with the Library District on air quality education.
- A site-specific volatile organic compound canister sampling system, activated under specific wind speed and wind direction conditions, was developed to address citizen concerns related to natural gas development within the Battlement Mesa planned unit development (PUD). The monitor was installed in early 2017.



The meteorological and volatile organic compound equipment tripod is lifted onto the roof of the Rifle Library.

Other Resources

Long-term air quality monitoring is just one piece of our air quality management program in Garfield County. Additional resources regarding air quality are available on the Garfield County Air Quality Management Website (www.garfield-county.com/air-quality) and include:

- Real-time air quality data
- Comprehensive annual air quality data reports
- Garfield County Public Health air quality management plans
- Emissions Inventories produced by the Colorado Department of Public Health and Environment (CDPHE)
- Special study reports and information
- Extensive educational materials

Air Quality monitoring and education programs in Garfield County continue to expand and evolve. We invite your input to help make better decisions about how to manage air pollution. Contact us with any feedback or concerns related to air quality in your area:

**Garfield County Public Health
Environmental Health Division**
195 W. 14th Street
Rifle, CO 81650
Phone: 970-625-5200

Reduce your own air quality impact!

Our lifestyle choices can make a significant impact on local air quality. Some examples of what you can do to protect our air include:

Reduce idling – Idling wastes fuel and money and adds to air pollution. In the winter, the best way to warm up your vehicle is to drive it.

Avoid burning – Burning leaves, yard waste and other materials adds to air pollution.

Upgrade your wood burning stove – Inefficient wood burning stoves are a large source of wintertime air pollution
