

The Air We Breathe

A report on Garfield County air quality monitoring results for 2008-2014



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Garfield County Energy Advisory Board
Rifle, CO
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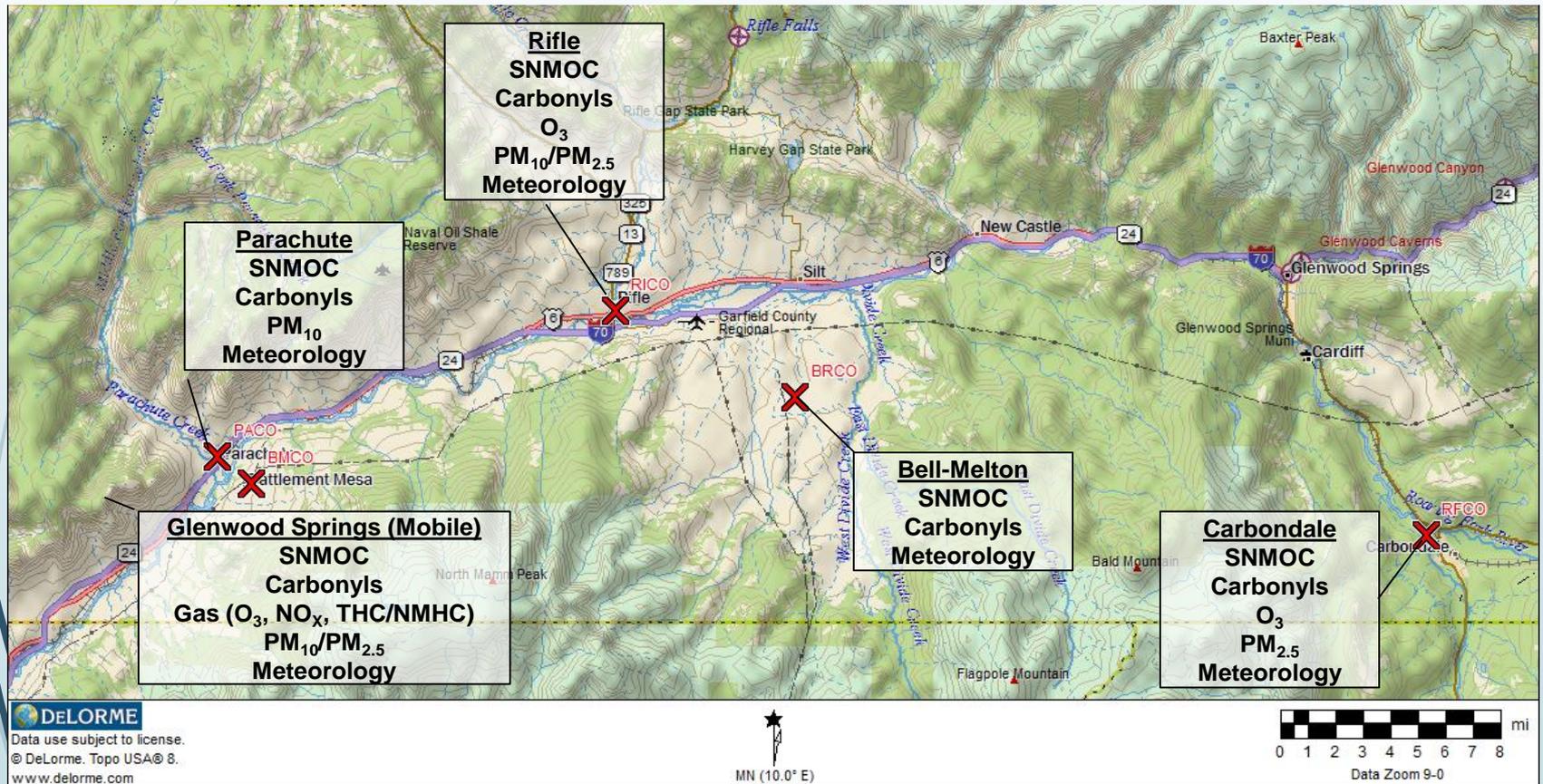
Presentation Content

- **2014 update:**
 - **Monitoring site locations**
 - **Data Availability**
- **Data since 2008**
 - **Criteria Pollutant summaries**
 - **VOC trends**
- **Other Research**



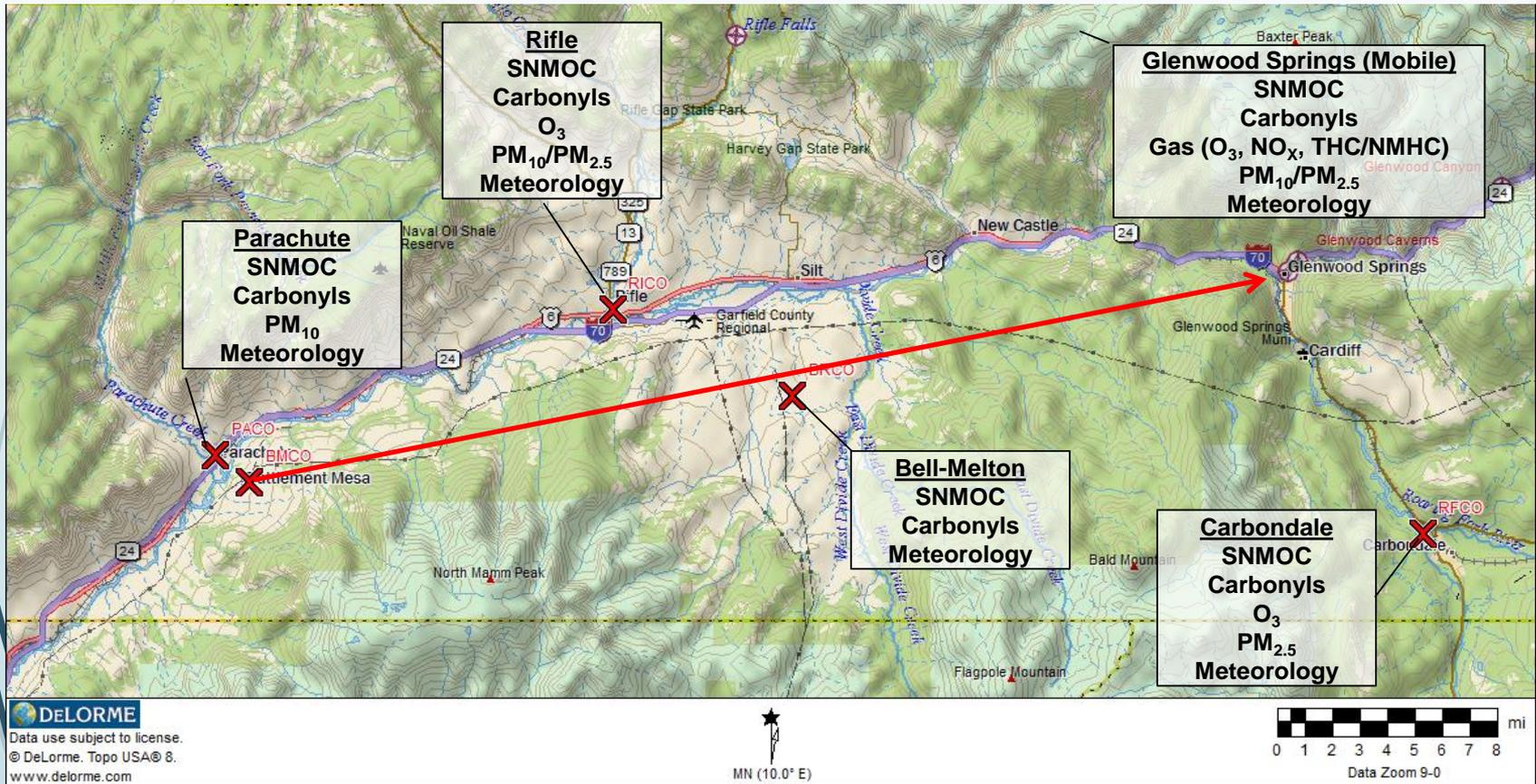
Mobile monitoring station currently located in Glenwood Springs

2014 Monitoring Site Locations



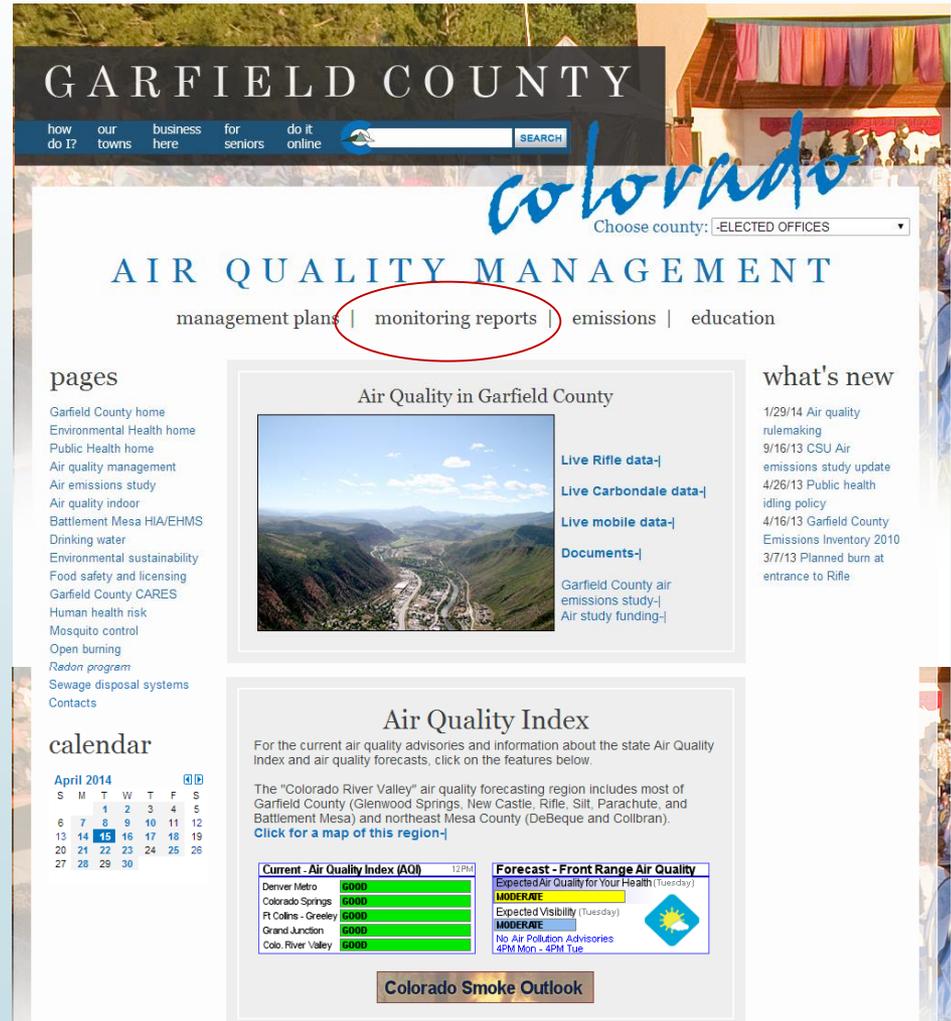
2015 Monitoring Site Locations

Mobile site moved from Battlement Mesa to Glenwood Springs in February, 2015



Annual Air Quality Monitoring Reports

- Reports since 2008 published on Air Quality Management website
- Include summaries of:
 - Meteorological measurements (e.g. wind speed and wind direction)
 - Criteria pollutants (e.g. ozone and particulate matter)
 - Volatile organic compounds (includes Hazardous Air Pollutants)



The screenshot shows the website for Garfield County Air Quality Management. At the top, there is a navigation bar with links for 'how do I?', 'our towns', 'business here', 'for seniors', and 'do it online'. Below this is a search bar and a 'SEARCH' button. The main heading is 'AIR QUALITY MANAGEMENT' with a sub-menu including 'management plans', 'monitoring reports', 'emissions', and 'education'. The 'monitoring reports' link is circled in red. On the left, there is a 'pages' section with various links like 'Garfield County home', 'Environmental Health home', etc. On the right, there is a 'what's new' section with recent news items. The central content area features 'Air Quality in Garfield County' with a landscape image and links for 'Live Rifle data-', 'Live Carbondale data-', 'Live mobile data-', and 'Documents-'. Below this is the 'Air Quality Index' section, which includes a calendar for April 2014 and a table of current and forecasted air quality data for various locations.

Denver Metro	6000
Colorado Springs	6000
Pt Collins - Greeley	6000
Grand Junction	6000
Colo. River Valley	6000

Expected Air Quality for Your Health (Tuesday)	MODERATE
Expected Visibility (Tuesday)	MODERATE
No Air Pollution Advisories	4PM Mon - 4PM Tue

New Data Report: Annual Air Quality Update “**Newsletter**”

- ▶ Annual air quality data summary report is large and comprehensive (~ 80 pages)
- ▶ A short annual update newsletter draft has been developed
- ▶ Hybrid of “Citizen’s Guide to Air Quality” and annual reports, which includes:
 - ▶ What’s new
 - ▶ Annual snapshot of results and trends
 - ▶ What’s next

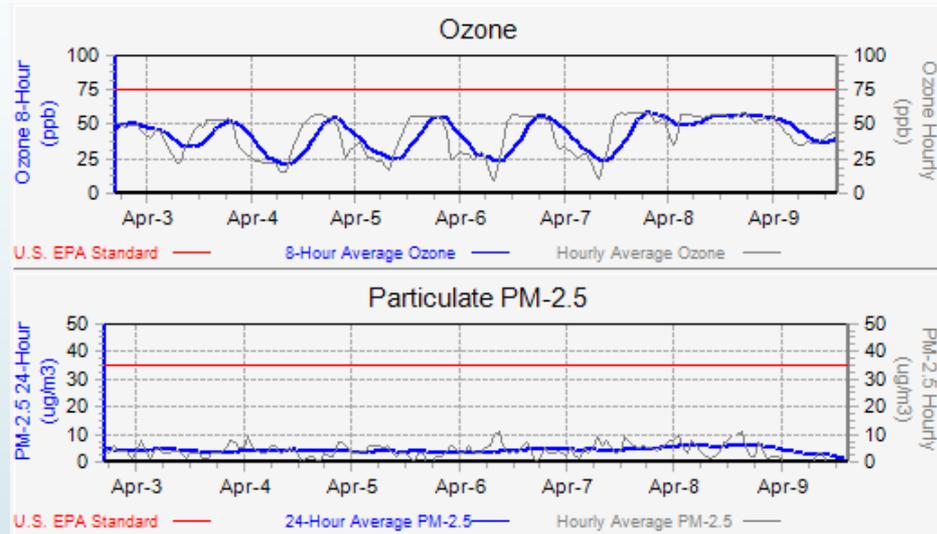
Real-Time data available on website

<http://www.garfield-county.com/air-quality>

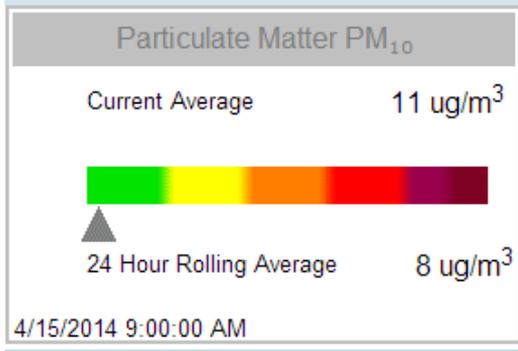
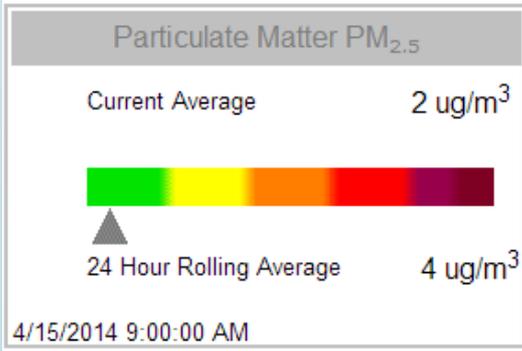
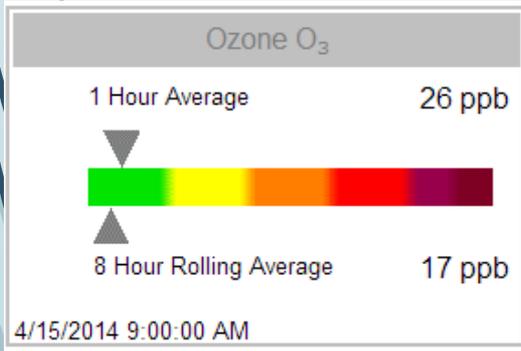
Real-time images (Rifle)



7-day Timeline plots



Air Quality Indices (Real-time Health Risk indicators)

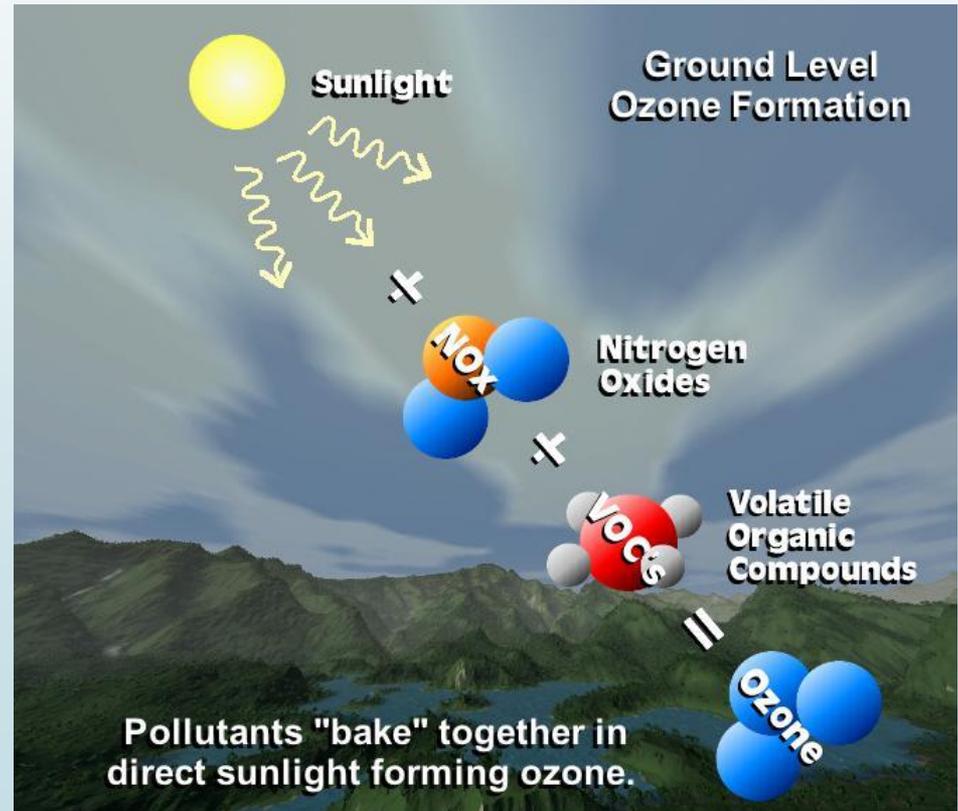


Criteria Pollutants: Measurements in Garfield County

- Criteria pollutants are specific pollutants regulated by EPA which are considered harmful to human health and the environment.
- Criteria pollutants measured in Garfield County include:
 - Ground Level Ozone (O₃)
 - Nitrogen Dioxide (NO₂)
 - Particulate Matter (PM)
- Measured values are compared to EPA National Ambient Air Quality Standards (NAAQS)

Criteria Pollutants: Ozone (O_3)

- ▶ Ozone is a pollutant that is not emitted directly, but formed through chemical reactions
 - ▶ Nitrogen Oxides (e.g. NO_2) and Volatile Organic Compounds (VOCs) are considered O_3 "precursors"



O₃ Measurements in Garfield County



Rifle- Health and Human Services

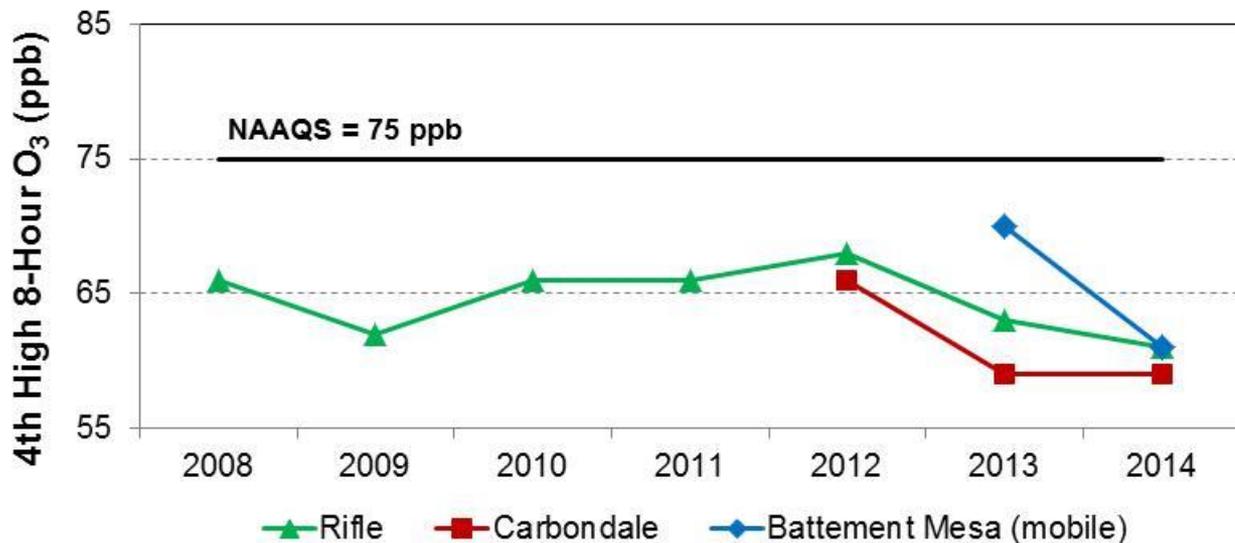


Carbondale-CRMS

O₃ Measurements in Garfield County

- ▶ National Ambient Air Quality Standards (NAAQS) for Ozone:
 - ▶ **Exceedance**: 8-Hour average of 75 ppb
 - ▶ **Violation**: 3-year average of the 4th highest daily maximum 8-hour > 75 ppb

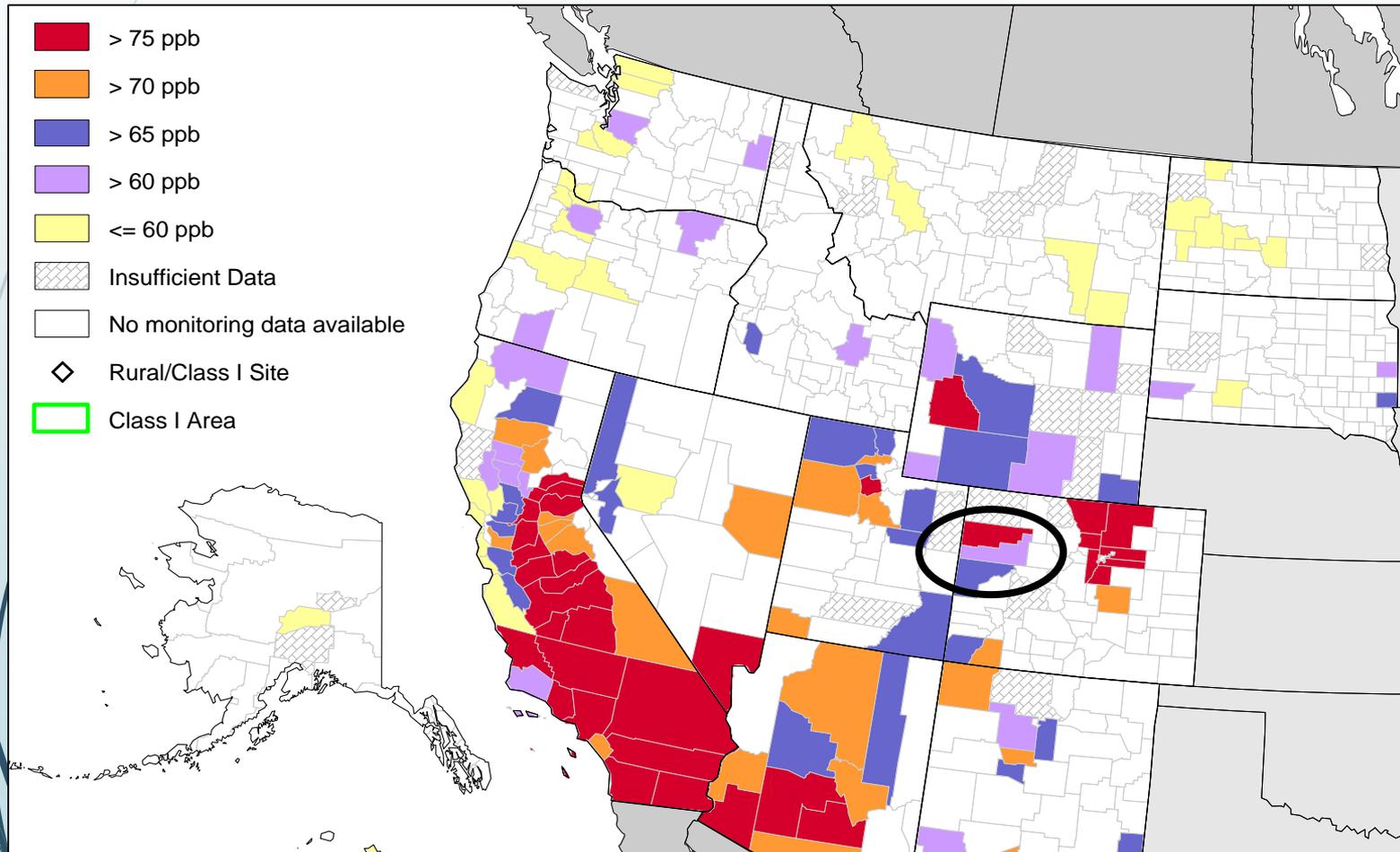
Two exceedances: 2008 and 2012
NO NAAQS violations



Year	Highest 8-hour average (ppb)	4 th highest 8-hour average (ppb)
Rifle		
2008	76	66
2009	64	62
2010	69	66
2011	68	66
2012	78	68
2013	66	63
2014	62	61
Battement Mesa		
2013	71	70
2014	64	61
Carbondale		
2012	69	66
2013	67	59
2014	64	59

Regional Ozone (2011-2013)

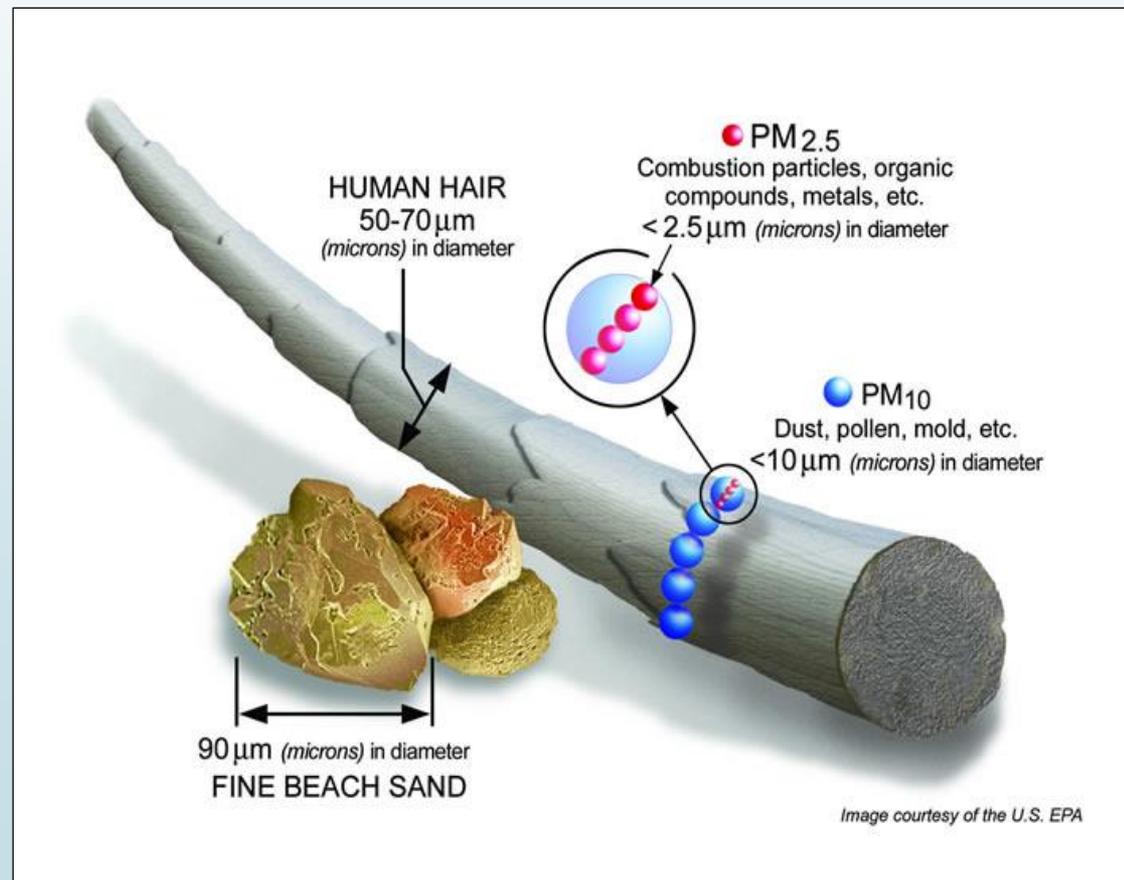
3-Year Average Daily maximum 8-Hour Ozone (County maximum)



Criteria Pollutants: Particulate Matter

- ▶ Particulate Matter (PM) is a mixture of solid particles and liquid droplets small enough to be inhaled

- **PM_{2.5} and PM₁₀ are particle sizes regulated by EPA**
- **Can be directly emitted, or formed in the atmosphere**
- **Generally made up of complex chemical mixtures (e.g. mineral oxides, sulfates, nitrates, organic material)**



PM₁₀ Measurements in Garfield County



Rifle – Henry Building



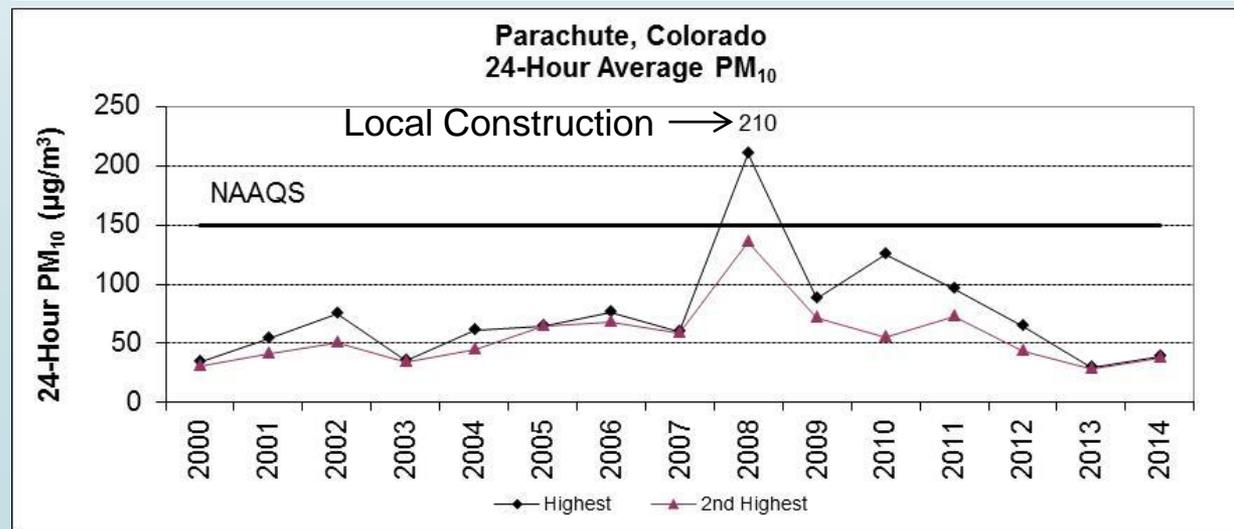
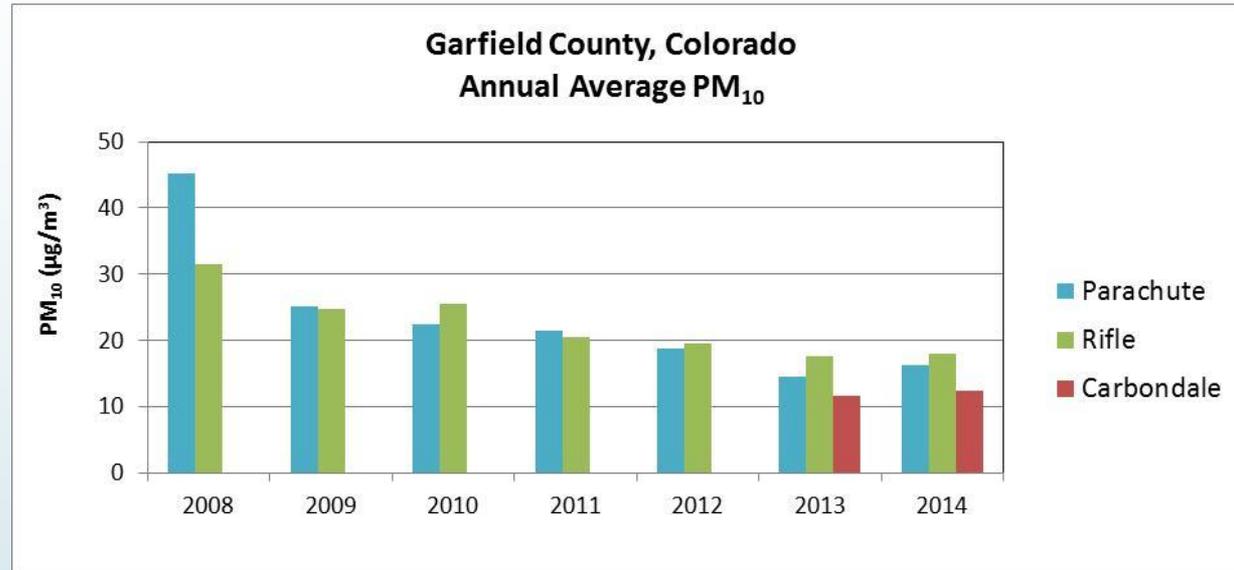
PM₁₀ Measurements in Garfield County

National Ambient Air Quality Standards (NAAQS) for PM₁₀

- **Exceedance:**
24-hour average of 150 $\mu\text{g}/\text{m}^3$
- **Violation:**
More than 1 24-Hour average > 150 $\mu\text{g}/\text{m}^3$ in a 3-year period

1 average >150 in 2008

No NAAQS violations



PM_{2.5} Measurements in Garfield County



Inside the Mobile Monitor



Carbondale- CRMS

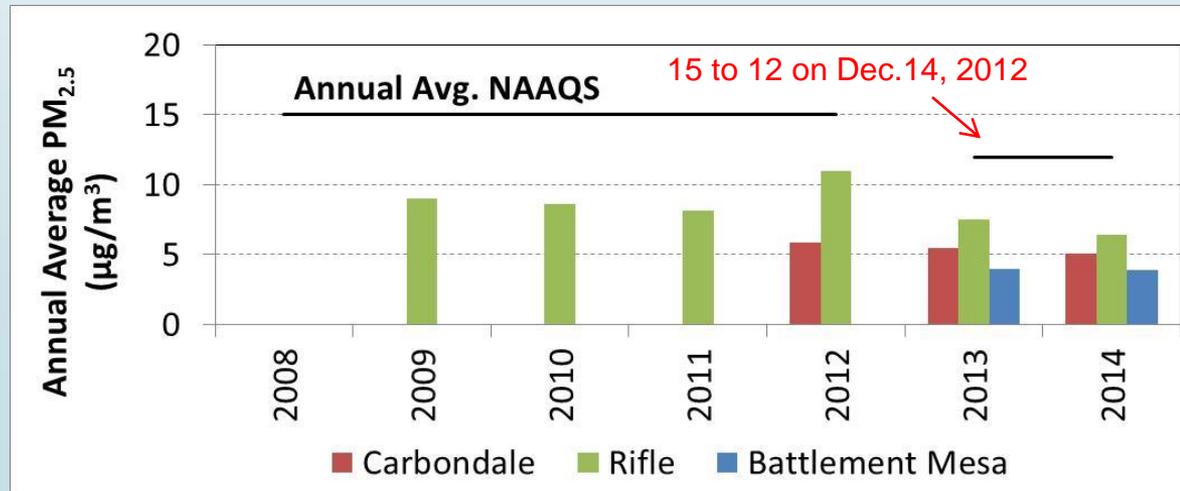
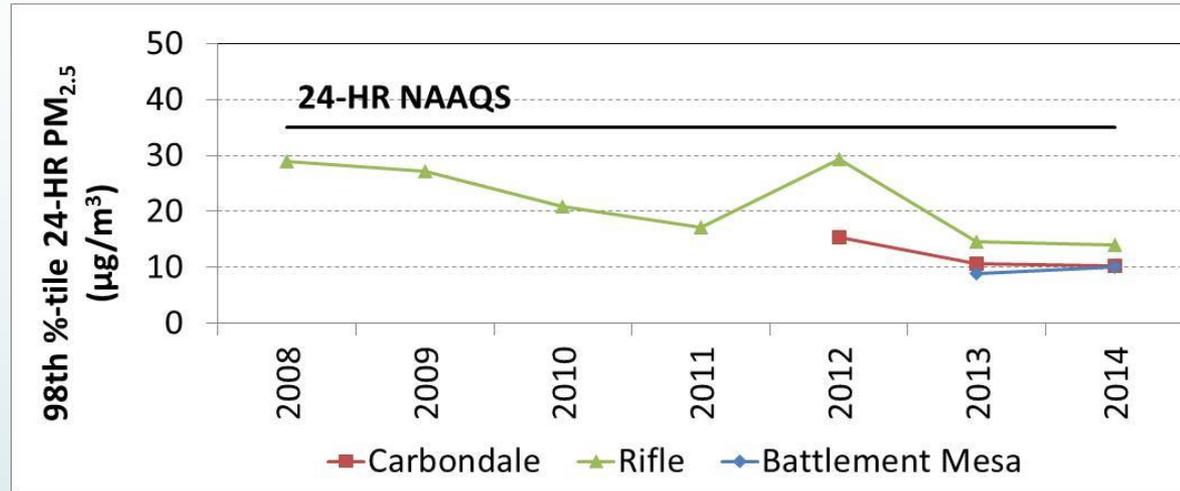
PM_{2.5} Measurements in Garfield County

► National Ambient Air Quality Standards (NAAQS) for PM_{2.5}:

► Exceedance:
24-hour = **35 µg/m³**
Annual = **12 µg/m³**

► Violation:
3-year average of 98th percentile 24-hour > 35 µg/m³ or
3-year average of annual mean > 12 µg/m³

No NAAQS violations



Air Quality Index (AQI) 2014 Summary

Air Quality	Cautionary Statements	Number of Days		
		Ozone (O ₃)	Particulate Matter (PM _{2.5})	Nitrogen Dioxide (NO ₂)
Good	None	357	354	333
Moderate	People who are unusually sensitive to air pollution should consider limiting prolonged or heavy exertion outdoors.	8	11	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	32

Volatile Organic Compounds (VOCs): Measurements in Garfield County

- Measured at five sites since 2008
- **90 compounds** analyzed
 - Major HAPS (e.g. BTEX and Formaldehyde)
 - VOCs related to natural gas exploration (e.g. propane and ethane)
 - Highly reactive VOCs which could contribute to O₃ formation
- Same sampling method, laboratory and analysis methods as used for the EPA Urban Air Toxics Monitoring Network
<http://www.epa.gov/ttnamti1/uatm.html>

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Volatile Organic Compounds (VOCs): Speciated Non-Methane Organic Compounds (SNMOC)

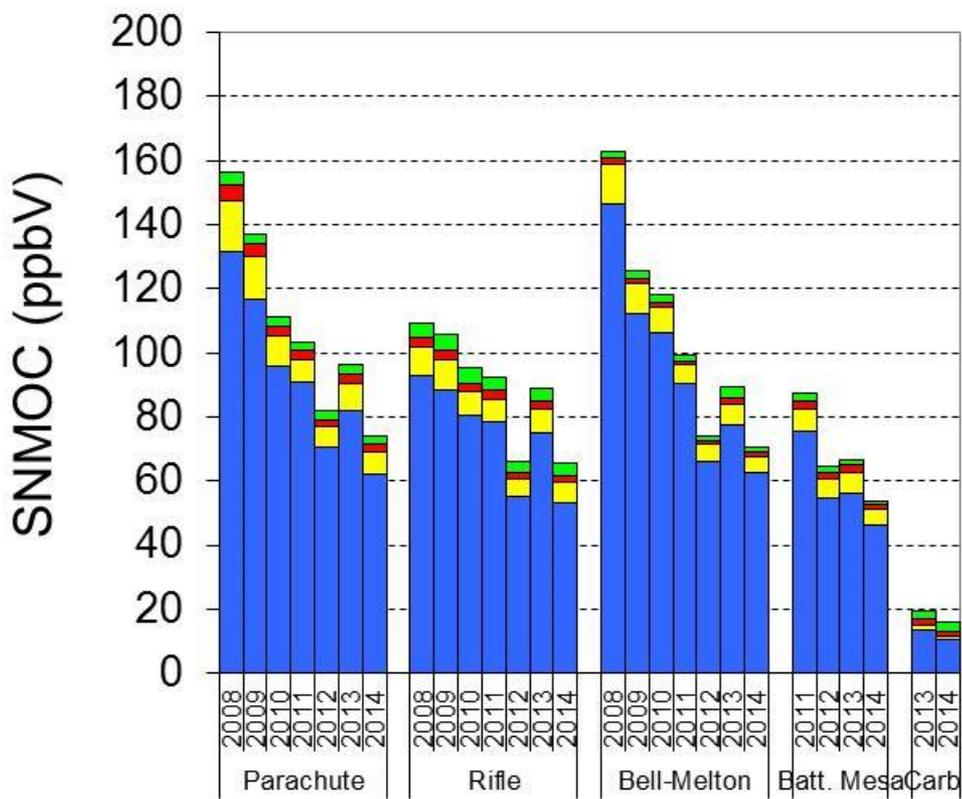
- 78 Compounds
- Sampled every 6 days for 24 hours



Parachute - Center for Family Learning

Volatile Organic Compounds (VOCs): Speciated Non-Methane Organic Compounds (SNMOC)

Total SNMOC Annual Averages



Alkenes: Complex compounds; refineries, biogenic sources

Aromatics: e.g. BTEX compounds, gas fire engine sources

Heavy Alkanes: Simple, long chain carbon compounds; sources include crude oil, diesel

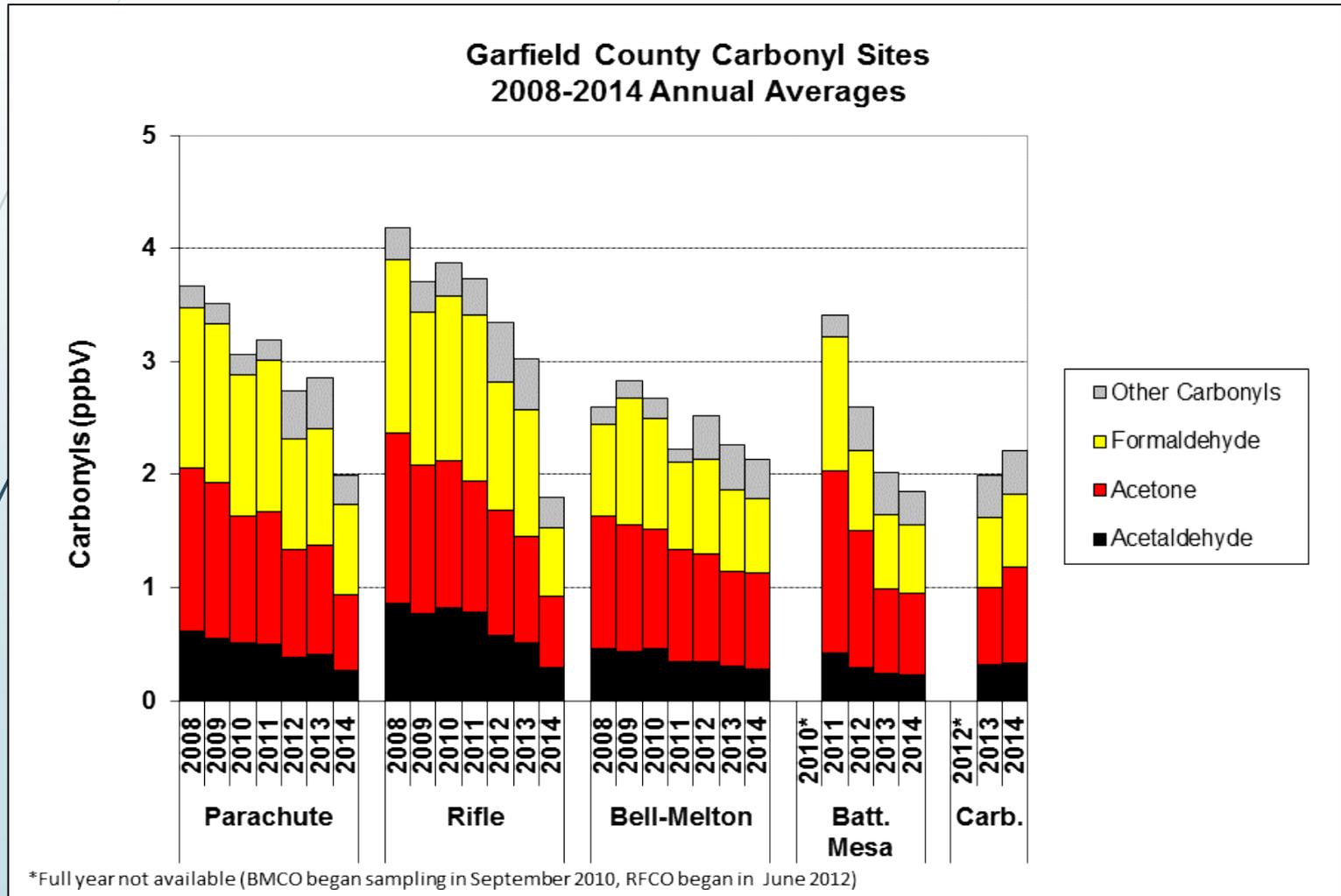
Light Alkanes: Simple, short chain (e.g. ethane, propane, iso/n-butane and iso/n-pentane); primary components of natural gas.

Volatile Organic Compounds (VOCs): Carbonyls

- ▶ **Include:**
formaldehyde,
acetone
- ▶ **Sources:** Fuel
combustion,
mobile sources, oil
refineries
- ▶ **Frequency:**
Sampled every 12
days for 24 hours



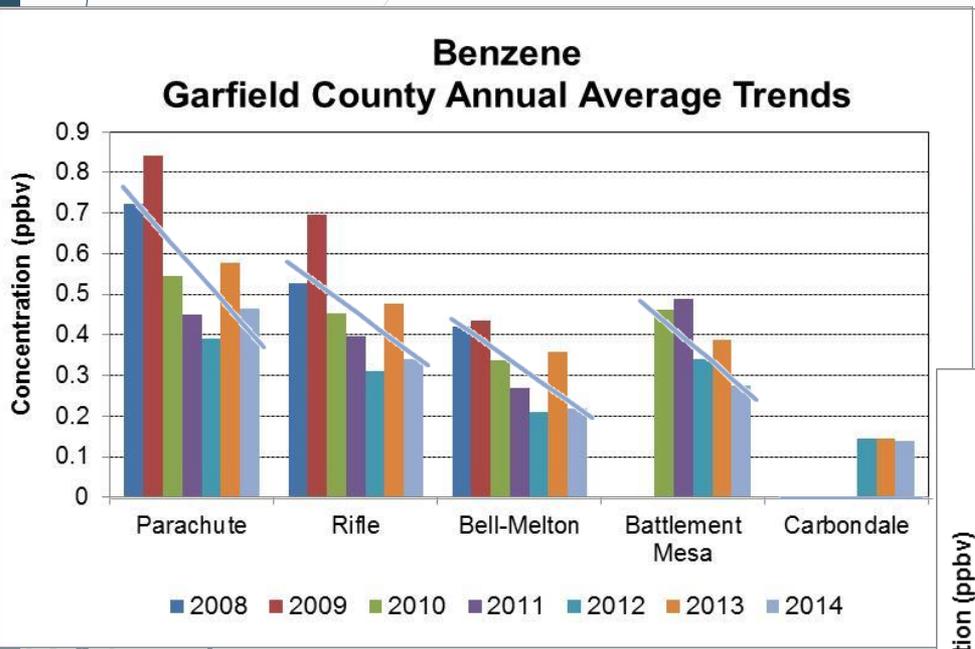
Volatile Organic Compounds (VOCs): Carbonyls



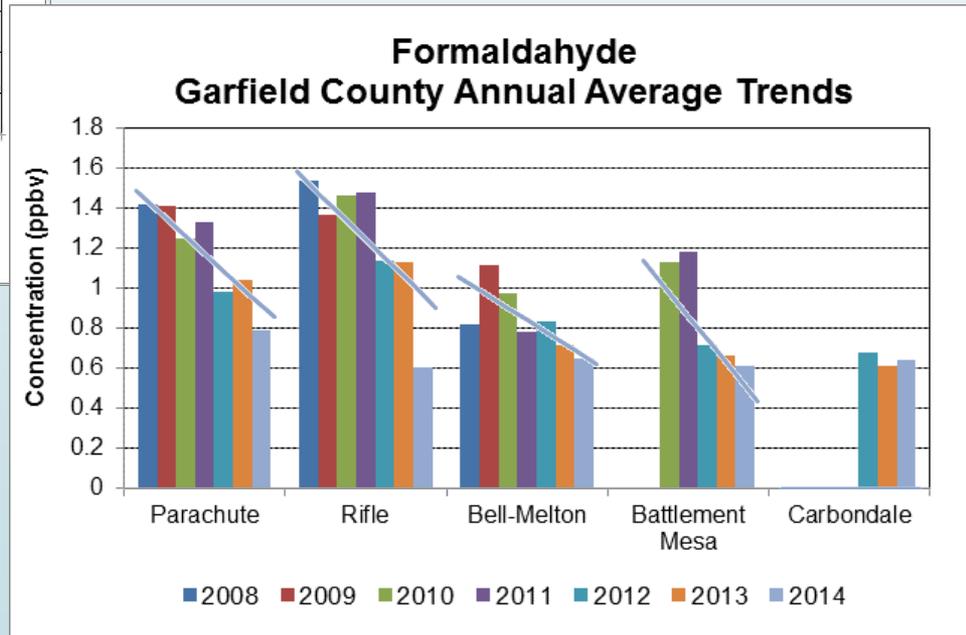
Hazardous Air Pollutants (HAPS)

- Approximately **190 VOC compounds** considered HAPs
- **21 HAPS** are measured in Garfield County including BTEX compounds (benzene, toluene, ethyl-benzene and xylenes)
- Annual data summary reports include trends in HAPs measured
 - Trends for 20 out of 21 HAPS compounds stable or decreasing
 - Example trend plots on following slides
 - Styrene is only HAP with increasing trend, but there are no known sources of styrene in Garfield County

Volatile Organic Compounds (VOCs): Trends



Benzene =
Urban and O&G related
(HAP)

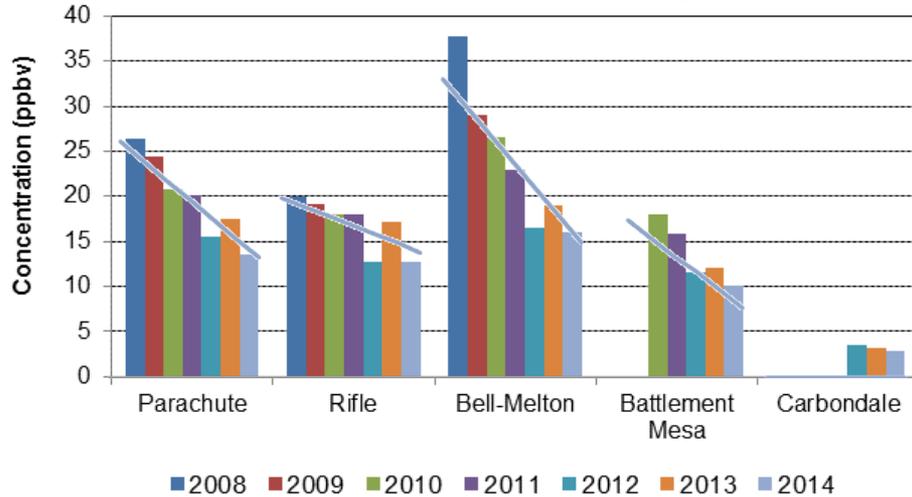


Formaldehyde =
Urban and O&G Related
(HAP)

Statistically Significant downward trends shown in blue (5 years required to calculate trend)

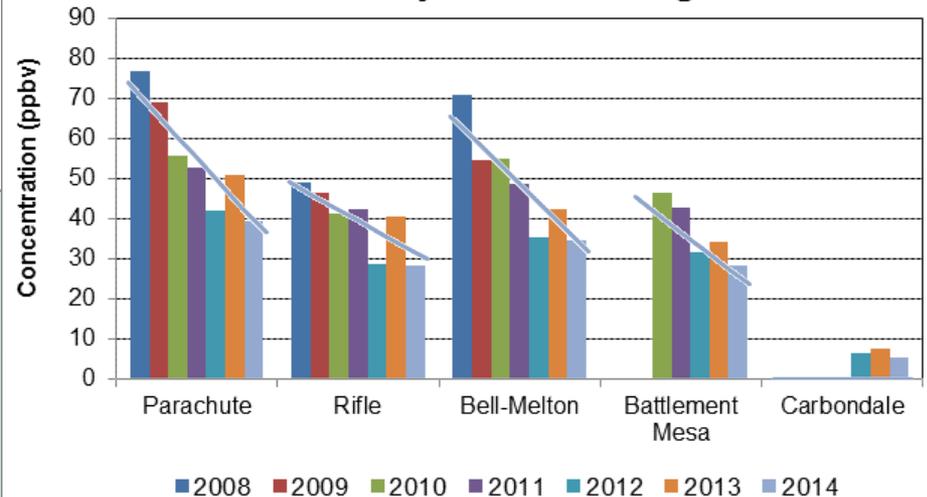
Volatile Organic Compounds (VOCs) Trends:

Propane
Garfield County Annual Average Trends



Propane =
O&G related
(not considered a HAP)

Ethane
Garfield County Annual Average Trends



Ethane =
O&G Related
(not considered a HAP)

Health Risk

- Garfield County Air Monitoring reports do NOT include information on health risk
- Air Quality Index (AQI)
- Health Risk Assessment
 - Provided by the Colorado Department of Public Health and Environment (CDPHE) in 2008
 - “Overall, the non-cancer hazards on either a chronic or short-term (average) basis do not exceed an acceptable value of one and the cancer risk estimates are at, or slightly above, the upper-end of EPA’s acceptable risk range.”

New report including data up to 2012 will be released and presented soon

Other Research:

Colorado State University Air Emissions Study

- Main Objectives:
 - Quantify emissions of chemical compounds (especially VOCs) during well development operations
 - Characterize how these compounds are dispersed in the atmosphere in the downwind plume near the site
- Current project completion set at the end of 2015

Summary

- ▶ Real-time air quality data, AQI indices and summary reports are available at <http://www.garfield-county.com/air-quality>
- ▶ Data collected through 2014 indicate that there continue to be **no violations** of National Ambient Air Quality Standards (NAAQS) in Garfield County
- ▶ Annual trends indicate most VOC species (including Hazardous Air Pollutants) continue to decrease at statistically significant measurable rates

Questions?

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