# Summary of Piceance Basin Water-Quality Reports

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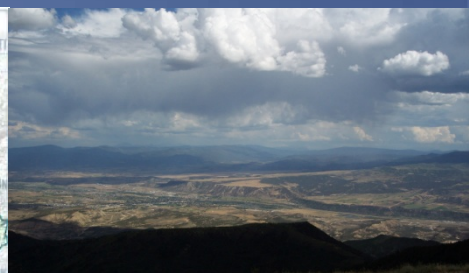


U.S. Department of the Interior
U.S. Geological Survey

# Prepared in cooperation with

(in alphabetical order)

- Antero Resources, Berry Petroleum Company, Bureau of Land Management, Chevron Corporation, City of Grand Junction, City of Rifle, Colorado Department of Agriculture, Colorado Department of Local Affairs (Energy/Mineral Impact Assistance Fund), Colorado Department of Natural Resources, Colorado Department of Public Health and Environment, Colorado Oil and Gas Conservation Commission, Colorado River Water Conservation District, Colorado Division of Wildlife - River Watch, Delta County, EnCana Oil & Gas (USA) Inc., Garfield County, Gunnison Energy Corp, National Park Service, Natural Soda, Inc., North Fork River Improvement Association, Oxy Petroleum Corporation, Petroleum Development Corp, Rio Blanco County, Shell Oil Company, Solvay Chemicals, Town of Carbondale, Town of De Beque, Town of Palisade, Town of Parachute, Town of Rangely, Town of Silt, Bureau of Reclamation, U.S. Forest Service, West Divide Water Conservancy District, Williams Companies.

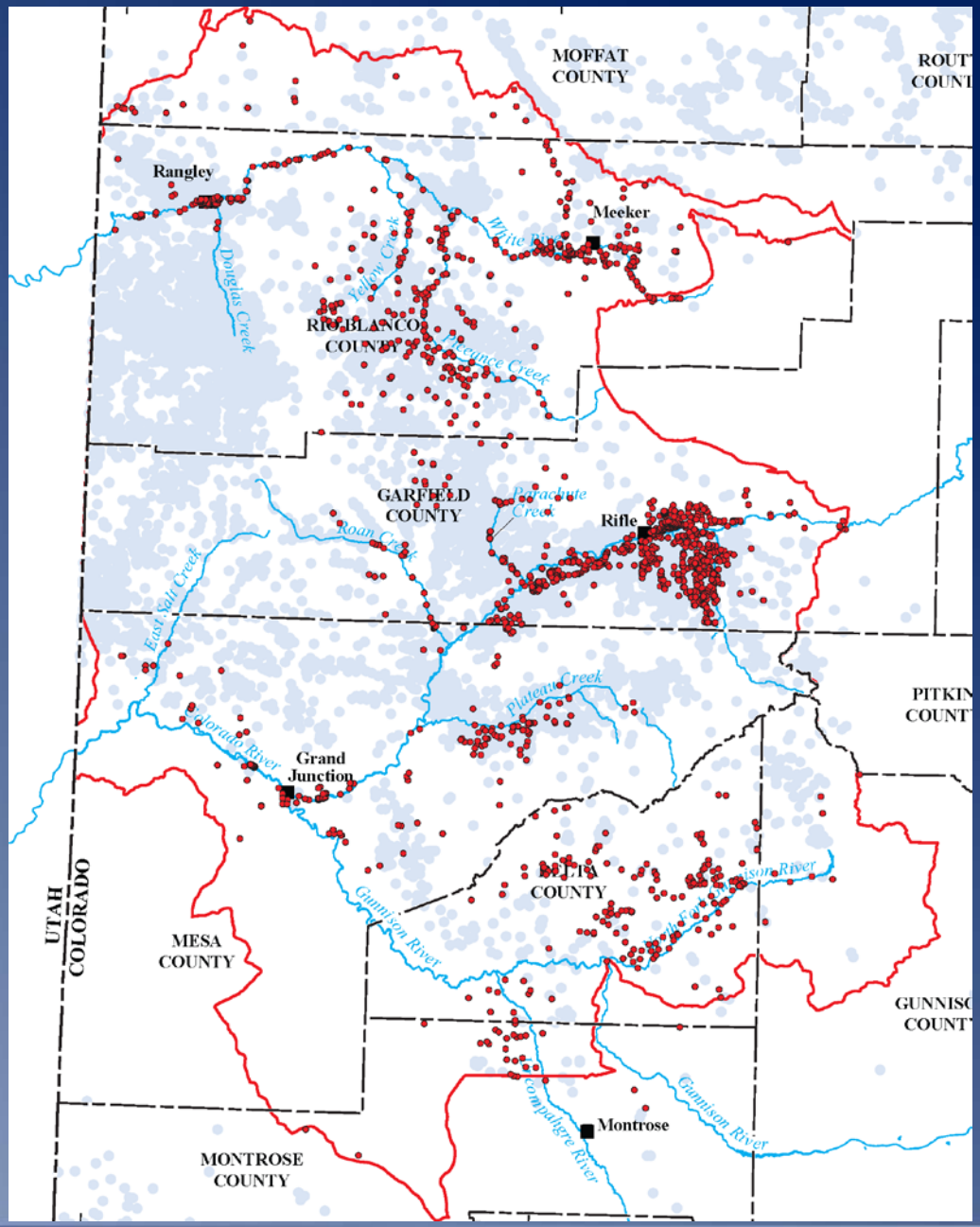
# Purpose of reports

These reports provide an overview of groundwater and surface-water quality data that have been compiled and put into a common data repository for the Piceance Basin from public and industry sources for the periods 1946 to 2009 (groundwater) and 1959-2009 (surface water).

# Outline

- Groundwater report
- Surface-water report
- Regional monitoring strategies
- Ongoing USGS Monitoring and Upcoming Reports

# Groundwater data in the Piceance Basin

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- Freshwater aquifers were
  - Quaternary deposits
  - Tertiary sedimentary rocks
  - Cretaceous sedimentary rocks
- Aquifer information often not available for wells
- Mostly domestic wells

| Geologic unit | Number of sites and samples |
|---|---|
| Quaternary | 144 |
| Tertiary | 44 |
| Cretaceous | 32 |
| Unknown | 1,325 |

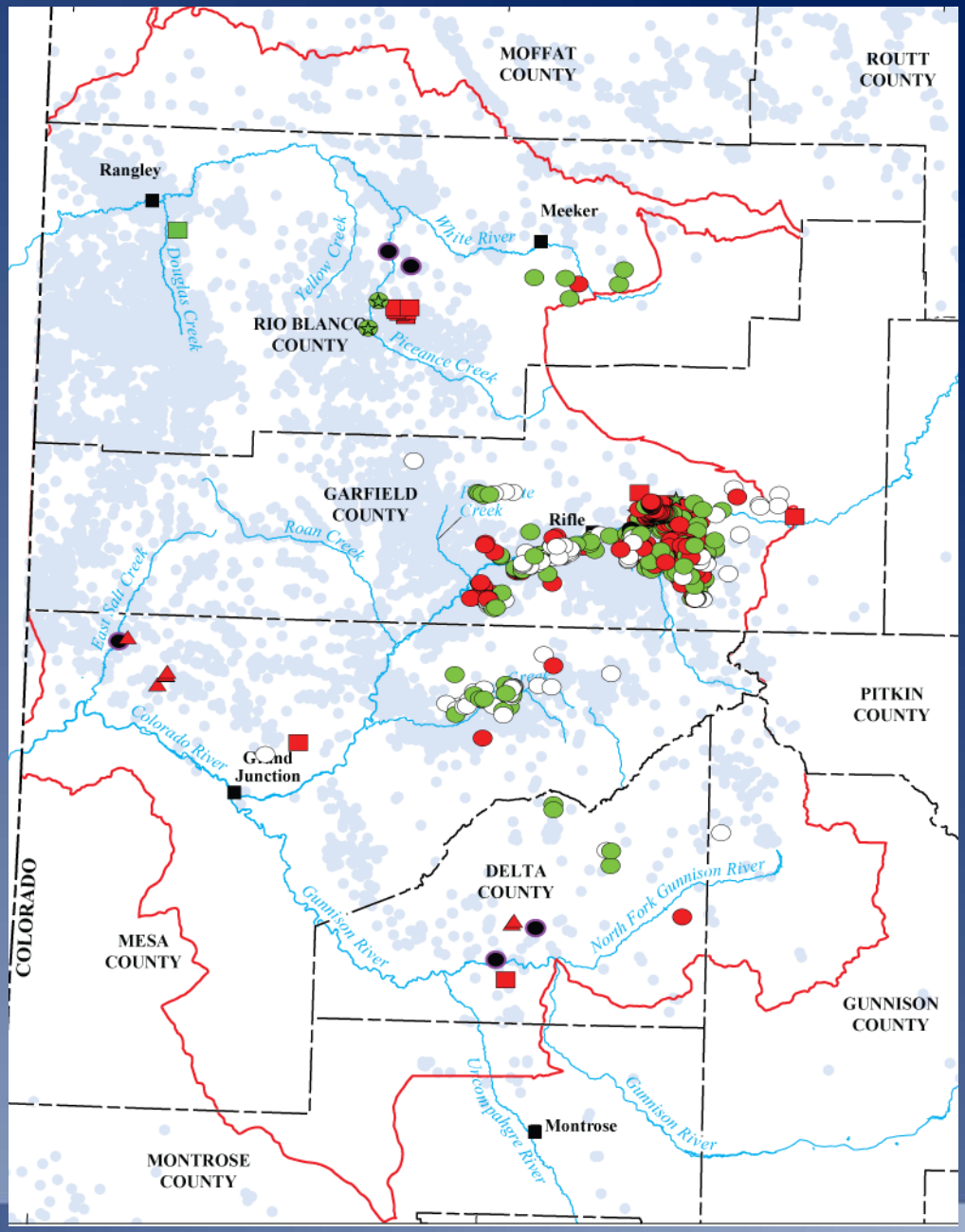
| Well type | Number of sites and samples |
|---|---|
| Monitoring | 444 |
| Domestic | 1,045 |
| Irrigation | 39 |
| Other/unknown | 58 |

# Dissolved solids

- 70 % of samples exceeded 500 mg/L (EPA secondary standard)
- Values greater than 7,000 mg/L in Rio Blanco County were associated with Green River Formation

Dissolved solids, milligrams per liter

- Less than 500
- Less than 1,000
- Less than 7,000
- Greater than 7,000

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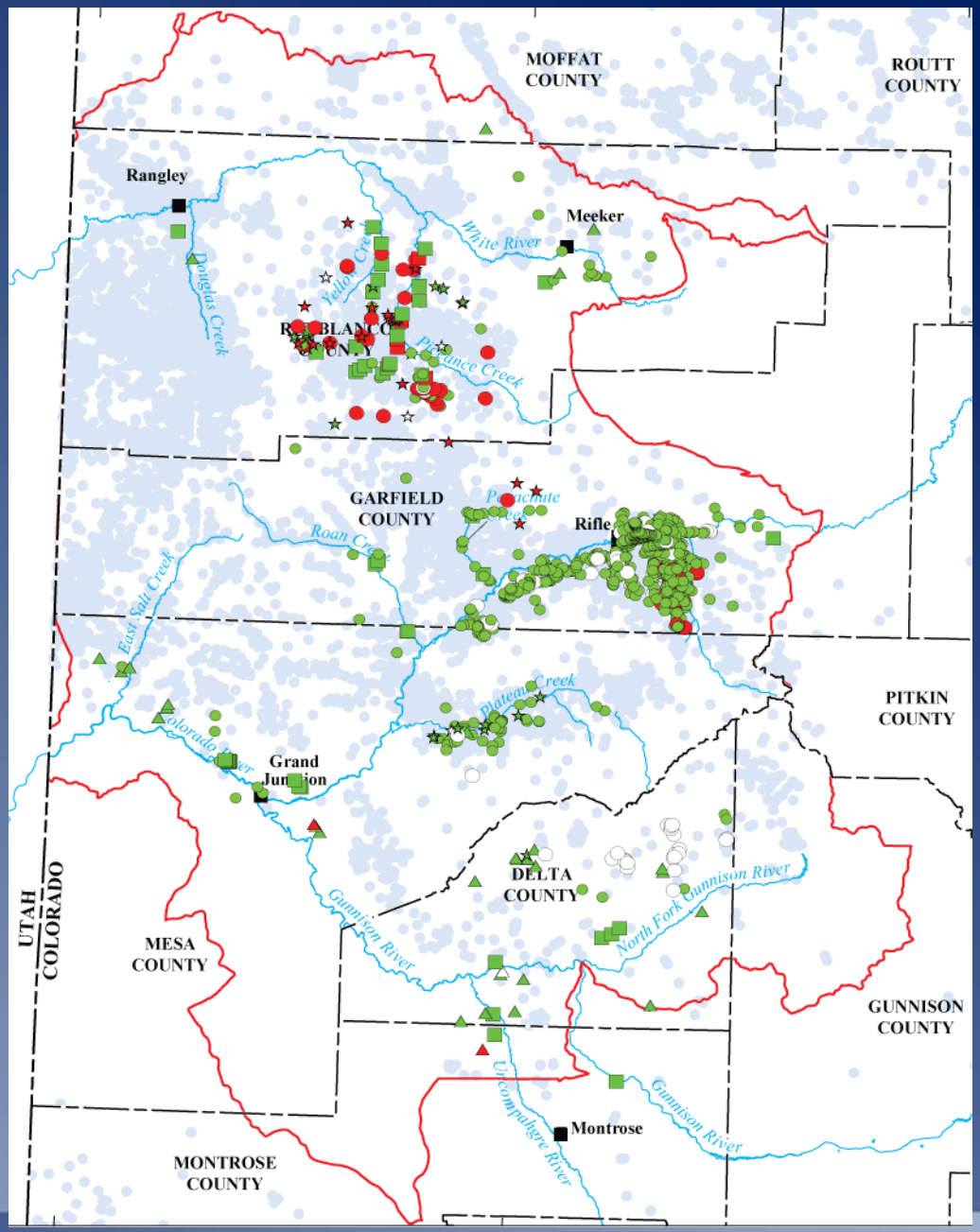
# Fluoride

- 8 % of samples exceeded the 4 mg/L primary standard
- Green River Formation in Rio Blanco County is one natural source
- Some exceedances in Mamm Creek area

Fluoride, milligrams per liter

- less than detection
- greater than detection and <4 mg/L
- ≥ 4 mg/L

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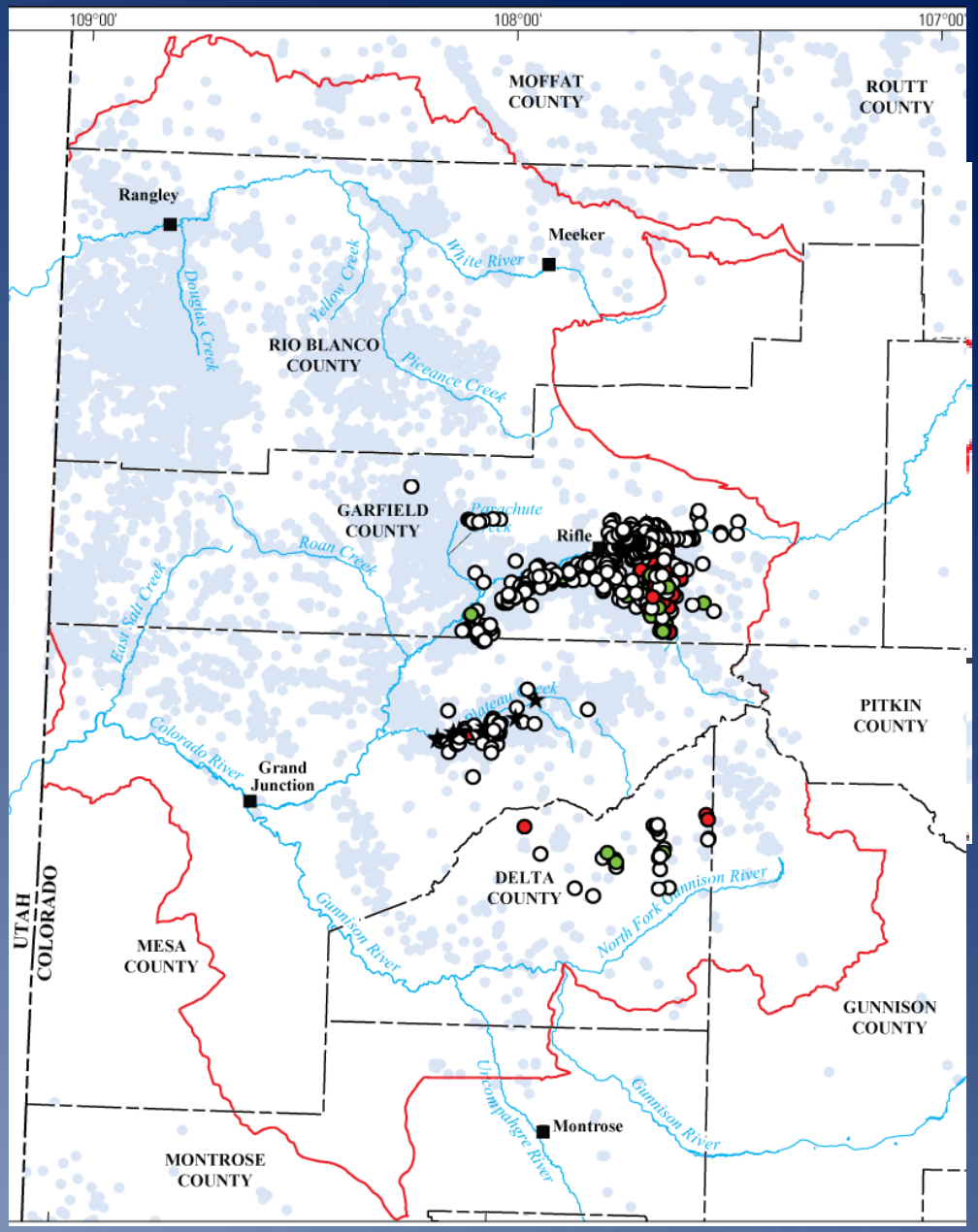
# Methane

- 24% of samples contained detectable methane, but median concentration was 0.001 mg/L
  - Only 4% of samples had data to distinguish biogenic from thermogenic methane, both types were detected
  - Biogenic methane commonly produced locally in aquifers
  - Thermogenic methane from deeper sources

Methane, milligrams per liter

- less than detection
- less than 1 milligram per liter
- greater than 1 milligram per liter

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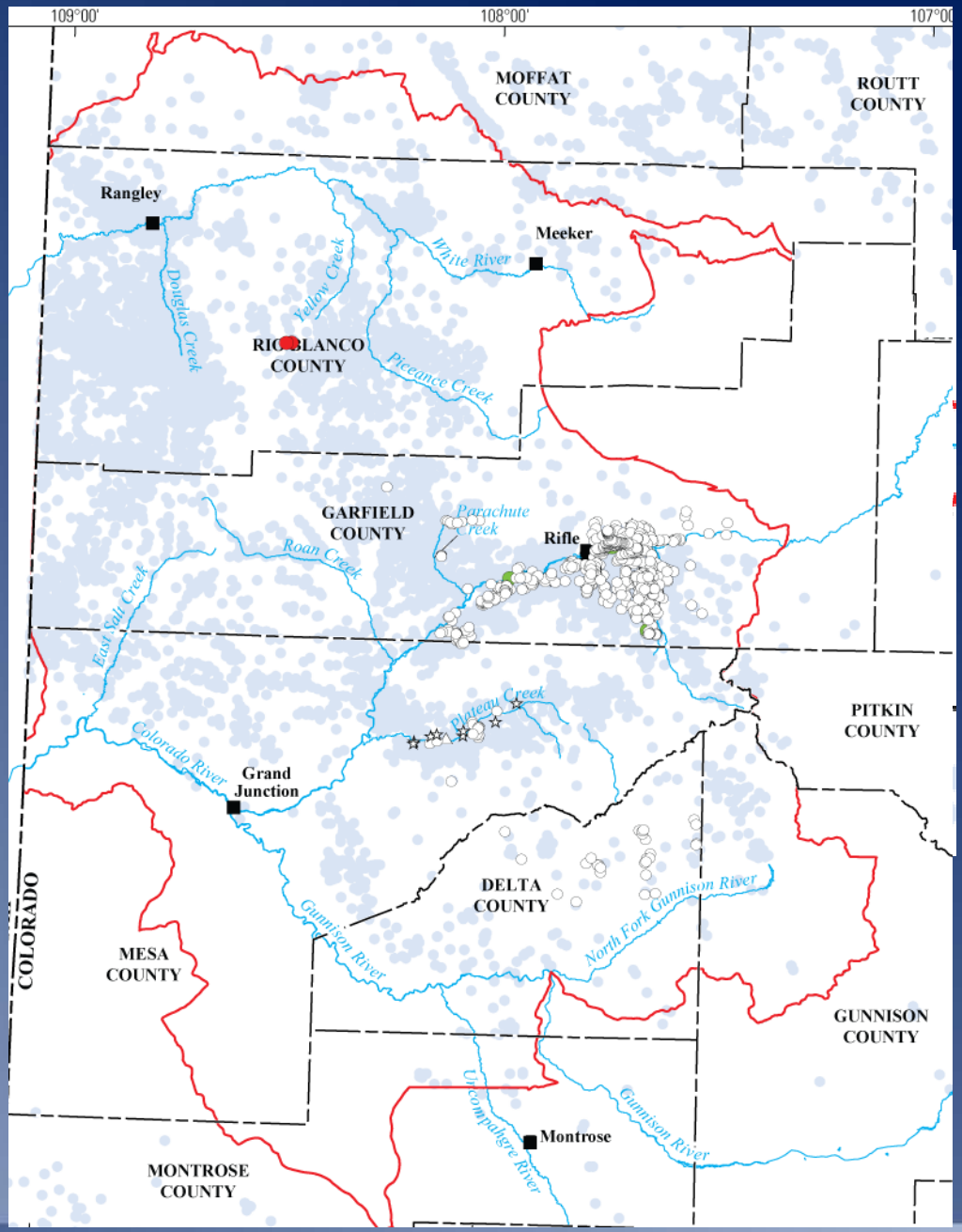
# Benzene

- Benzene was detected in 1.4 % of the samples

- Only 0.4 % of samples had a benzene concentration that exceeded the 5 microgram per liter drinking-water standard

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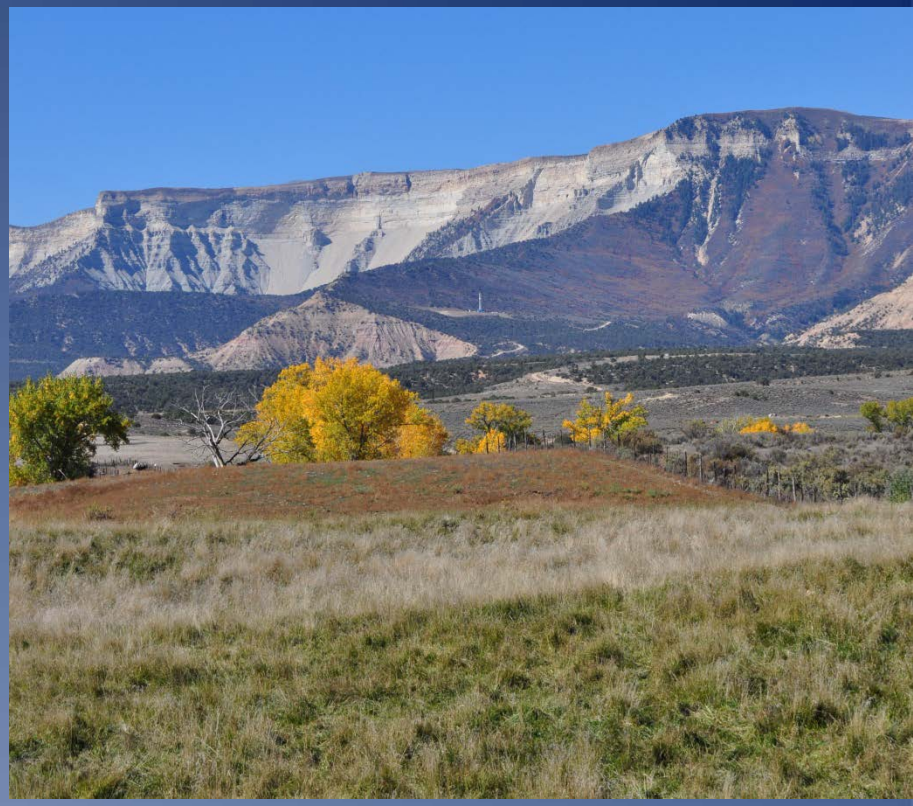
# Limitations and Opportunities in Groundwater

- **Limitations**
  - **Most of data are in Garfield County**
  - **Key constituents underrepresented**
  - **Needed well depth, depth to water, and geologic unit**

- **Opportunities**
  - **A few relatively minor adjustments to monitoring protocols could make data sets more comparable**



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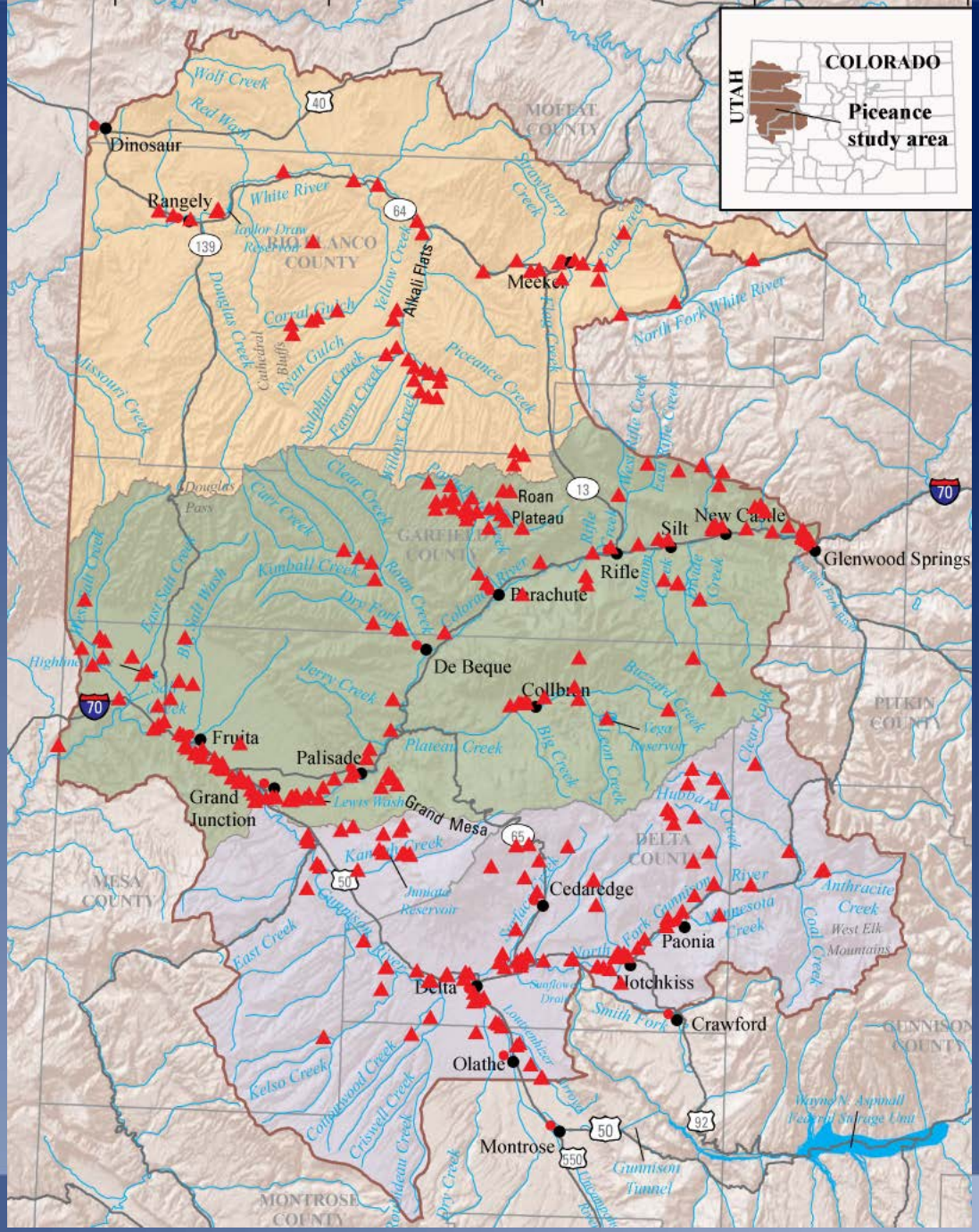
# Surface Water in the Piceance Basin

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# Summary Statistics and Comparison to Water-Quality Standards

- Available for all sites in Appendix 1
- Organized by Basin
- Provides valuable baseline of available information

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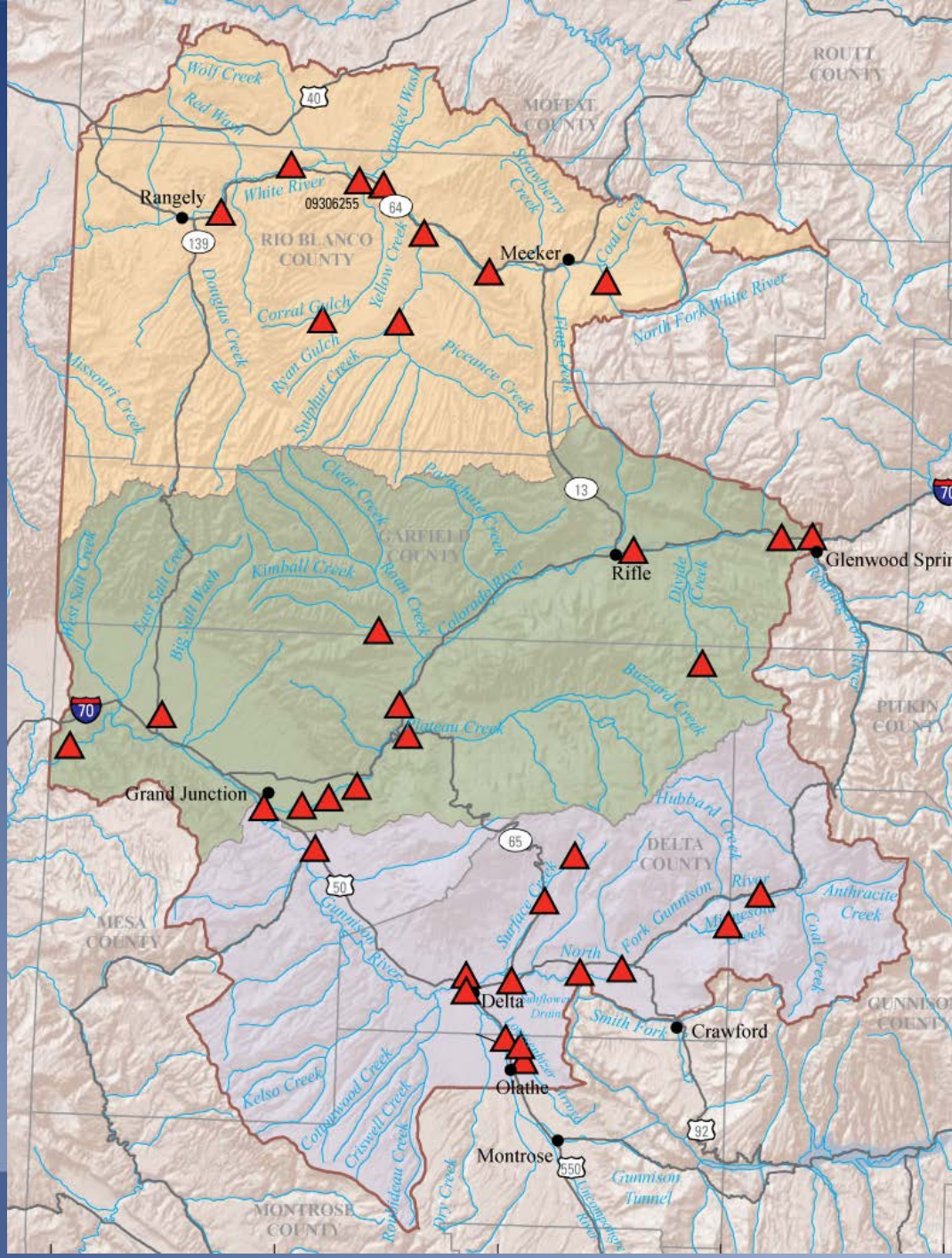
- Loads and Trends
  - Smaller set of sites
  - Loads used to understand sources

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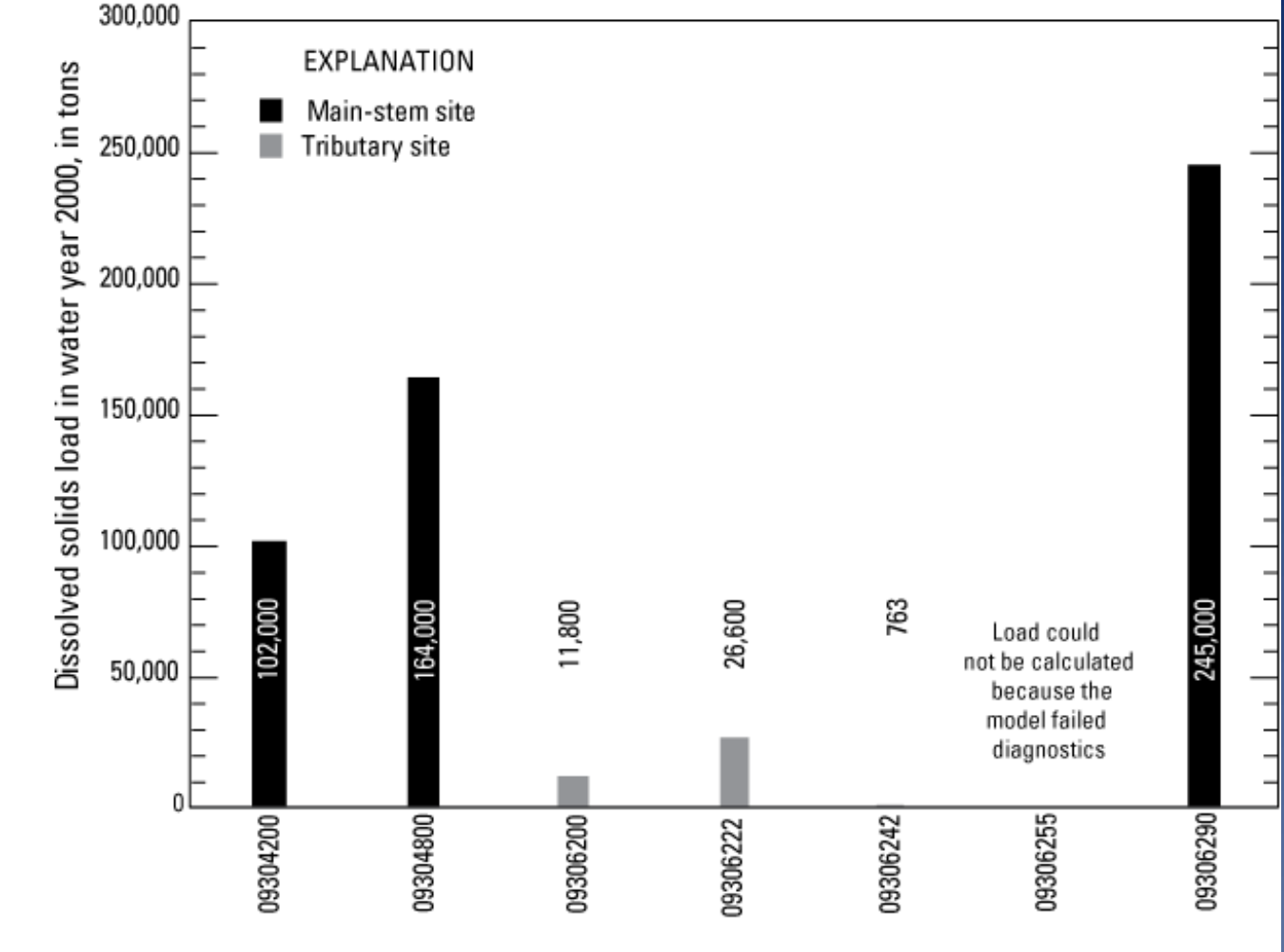
# Loads for dissolved solids on White River, water year 2000

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# Trends by Basin

- White
  - Upward trends in nitrate and total phosphorus near Meeker (White River above Coal Creek)
- Colorado
  - Downward trend in dissolved solids (salt) at state line
- Lower Gunnison
  - Downward trends in selenium at the mouth

# Data Gaps and Monitoring Opportunities

- White
  - Increase monitoring on tributaries
- Colorado
  - Increase monitoring between Glenwood Springs and Cameo
- Lower Gunnison
  - Expand constituent suite to include nutrients and additional trace elements aside from selenium

# Regional Monitoring of Groundwater and Surface Water

- Based on report findings
- Regional monitoring approach for both groundwater and surface water
- Provided to cooperator group to inform decision making

# Ongoing USGS Monitoring and Upcoming Reports

- **USGS sampling surface water and groundwater in study area**
  - **Ongoing surface-water quantity and quality data collection throughout the study area**
  - **USGS groundwater sampling network in Rio Blanco County for BLM**
- **Upcoming reports**
  - **Scientific Investigations report and fact sheet for groundwater data collection in Rio Blanco County**
    - **Chemistry and Age of Groundwater in Bedrock Aquifers of the Piceance and Yellow Creek Watersheds, Rio Blanco County, Colorado, 2010-12**
  - **Scientific Investigations report in Rio Blanco County surface water /groundwater interactions**
    - **Characterization of Surface-Water Hydrology and Surface-Water Quality of Piceance Creek in the Alkali Flat Area, Rio Blanco County, Colorado, March 2012**

# Thank you!
# Questions

## Reports can be found online at *http://pubs.er.usgs.gov*

- Groundwater
  - *http://pubs.usgs.gov/sir/2012/5198/*
- Surface water
  - *http://pubs.usgs.gov/sir/2013/5015/*