

INTRODUCTION TO THE STUDY

The “Community Health Risk Analysis of Oil and Gas Industry Impacts in Garfield County” was a response to a request for proposals for projects that would address public environmental needs in Garfield County. These projects were to be funded by a fine levied on EnCana Oil and Gas (USA), Inc. as a result of a violation of Colorado Oil and Gas Conservation Commission (COGCC) rules. All proposals were due by August 30, 2004. The Garfield County Energy Advisory Board (EAB) discussed the proposals at a meeting on September 2, 2004, at which they made a decision to forward a recommendation to the Garfield County Board of Commissioners to fund three of the proposals. On September 6, 2004, the Garfield County Board of County Commissioners selected three proposals for funding, one of which was the “Community Health Risk Analysis of Oil and Gas Industry Impacts in Garfield County.” The initial work on the project was begun by Dr. Teresa Coons (St. Mary’s Saccomanno Research Institute) and Dr. Russell Walker (Environmental Sciences and Technology Department, Mesa State College) shortly thereafter, although the final Scope of Work and contract were not signed by the Board of Commissioners until December 31, 2006.

Oil and gas activity within Garfield County has generated public concern with regard to impacts on both the environment and public health. Often, public perception of potential health risks becomes an overriding concern. The public may feel as though their health is at risk and they may wish to obtain an understanding of possible threats to their health, as well as acknowledgement by the oil and gas industries of their concerns. Opening this dialogue through discussion of the real and perceived impacts of extractive industries and could serve as a focal point for collaborative resolutions to community and industry concerns over the balance between the risks and benefits of natural resource extraction.

FOCUS OF THE STUDY

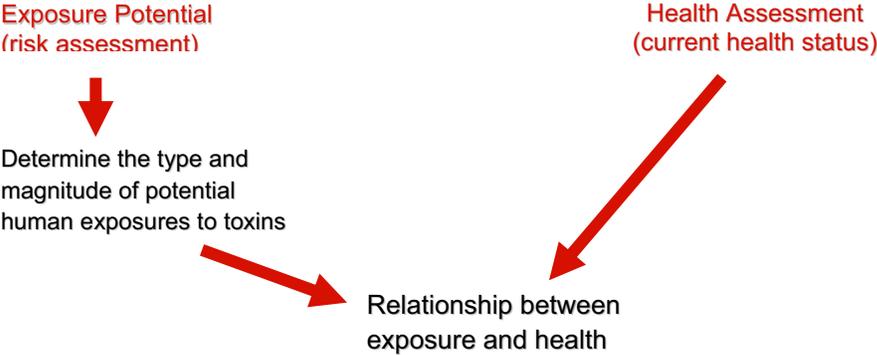


Figure 1. Relationship between Exposure Potential and Health Assessment

Risk Assessment

- Characterize the “sources”
- Natural Gas Operations
- Model showing potential pathways for movement of contaminants from source to human exposure
- Other sources of potentially toxic materials (e.g. mines, mill tailings, landfills, agricultural spraying)?
- Characterize the “contaminants”
- Collect and interpret data on contaminants and their concentrations
- Summarize toxicological information on contaminants

Risk Characterization

- Develop “probability statements” about risk to individuals within the community (current or future risk)
- Exposure potential (proximity to source, dose, etc.)
- Probability of suffering harm from exposure (incorporates factors related to age, health status, etc.)

Health Assessment

- Perception of Health
- How do community members feel about their health and the health of others in the community?
- What do community members feel are the determinants of health in their community?

Matching Perception with Reality

- Statistical health data and self-reported health information

Merging Risk and Health Data

- Point-in-time” picture of the health status of residents of Garfield County
- Information about determinants of health picture
- Relationships between exposure and health status
- Recommendations
- Data gaps that should be filled
- Possible future monitoring needs
- Options for managing risk

STUDY LIMITATIONS

- Funding: study may uncover issues or areas that need more in-depth research than can be performed with existing funding
- Lack of baseline health data with which to determine trends or changes
- Relatively new presence of the industry in the region: health outcomes may not yet be apparent
- Both risk and causation involve probability statements: may never be able to say with certainty that a particular health condition is caused by an exposure to a potentially toxic material.

STUDY AREA

The primary focus of this health and risk assessment study is Garfield County. Mesa, Montrose, and Delta Counties were selected as comparison counties for the health assessment portion of the study. These three counties share a Western Slope of Colorado location with Garfield County (and hence, some common population demographics and culture). However, they all, currently, have fewer impacts from natural gas industry drilling and processing activities.

EXTRACTIVE INDUSTRIES IN COLORADO AND GARFIELD COUNTY

This study was initiated, in large part, because of local concerns about health-related impacts of the natural gas industry. However, it is important to put those impacts into a context that includes natural gas activity in other parts of Colorado (including the comparison counties), as well as impacts from other extractive industries that are now or have in the past, operated in Garfield County.

Natural Gas. The natural gas industry in Garfield County has grown rapidly, over a relatively short period of time, both in scope and intensity. In 1988, a total of 19 permits were issued by the COGCC for drilling in Garfield County (www.oil-gas.state.co.us/staffreports). By 2002, which according to some observers marks the observable beginning of the current “boom”, 362 permits had been issued. In 2007, 2550 drilling permits were issued. The following tables and graphs were obtained from the Colorado Oil and Gas Conservation Commission (COGCC) website: www.oil-gas.state.co.us/.

Table 1. Annual permits to drill issued by the Colorado Oil and Gas Conservation Commission (www.oil-gas.state.co.us/staffreports). The number of drilling permits issued does not fully reflect the impacts) of the natural gas industry in a region. A more accurate reflection of industry activity is the number of wells actually being drilled (as reflected by the number of operating drill rigs) and the number of actively producing wells.

	Garfield County	Mesa County	Montrose County	Delta County	Weld County	La Plata County	Cheyenne County
1988	19	1	0	1	424	302	203
2001	353	27	3	0	702	156	3
2002	362	30	2	7	760	104	3
2003	657	27	4	4	757	162	3
2004	796	54	2	5	832	102	3
2005	1509	136	0	10	901	115	10
2006	1845	265	1	9	1418	235	21
2007	1550	293	3	2	1527	251	15

Figure 2.
DRILLING RIGS RUNNING IN COLORADO
BY COUNTY EACH WEEK IN 2007

(Based on Data in Anderson Reports Weekly Rig Status Report)

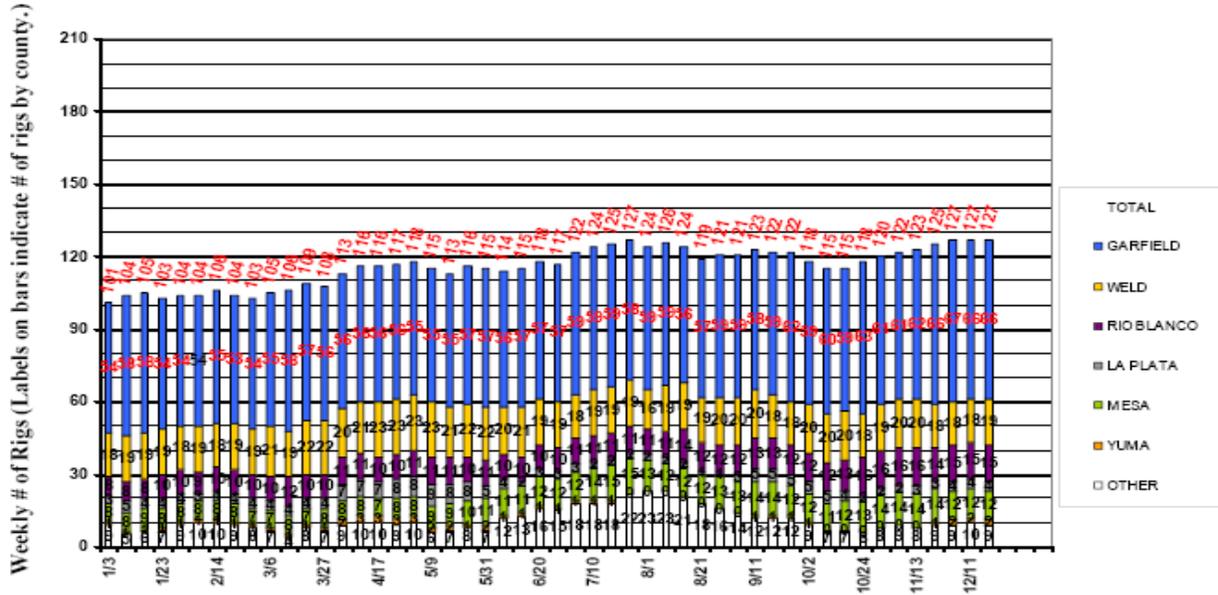
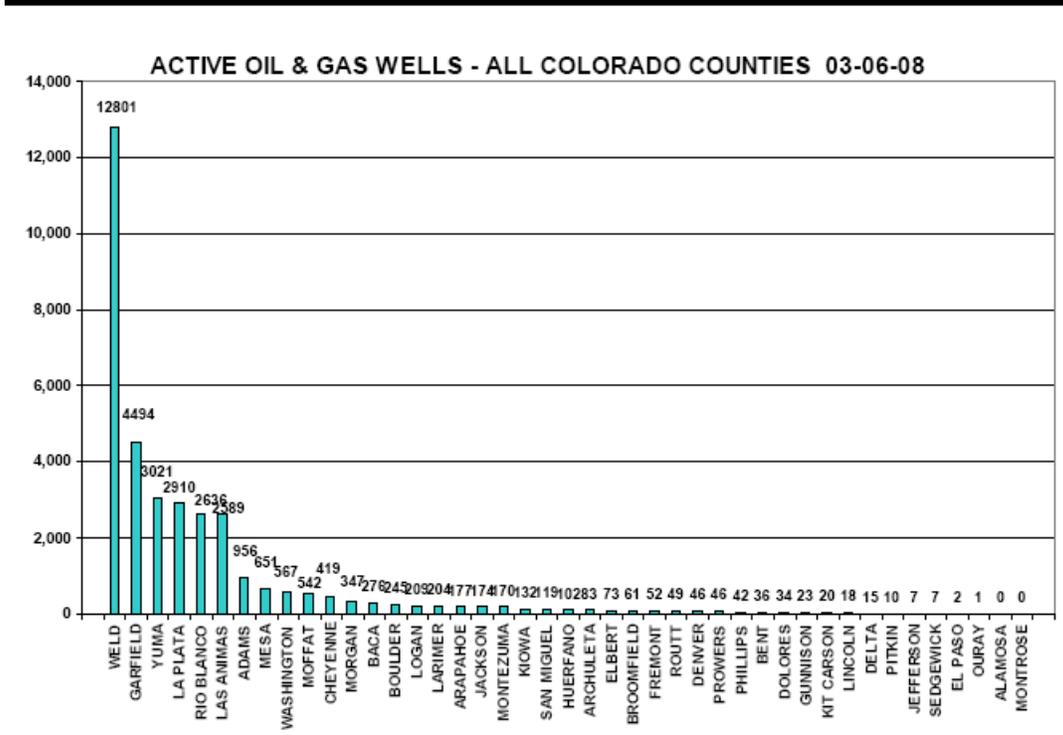


Figure 3.



Coal Mining. Other current and historic mining activities in Garfield County include coal, uranium, and gravel mining. The McClane Canyon underground coal mine is located in the far western part of Garfield County. Coal mining also takes place in Delta and Montrose Counties, and has taken place in Mesa County in the recent past.

Figure 4. Location of Coal Mines, Power Plants, Railroads and Coal-bearing Regions in Colorado, 2006. Colorado Geological Survey, Information Series 75, Colorado Mineral and Energy Industry Activities

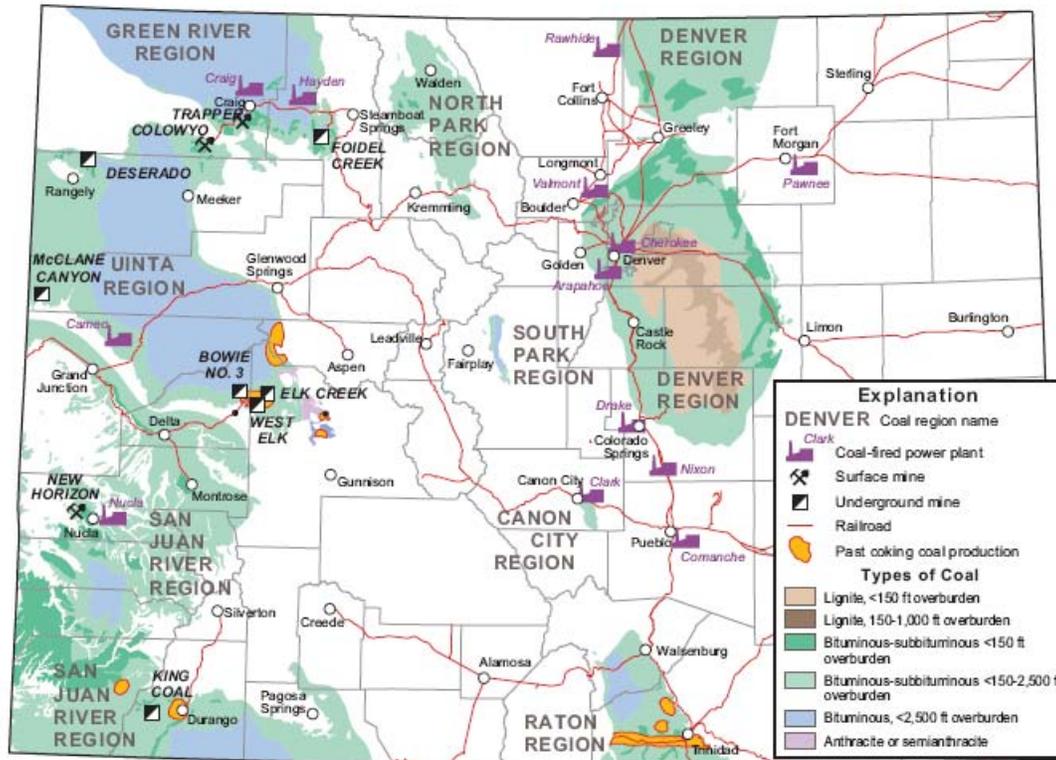


Table 2. Colorado Coal Mine Statistics, 2006. Colorado Division of Reclamation, Mining and Safety.

County	Parent Company	Operator	Mine Names	Coal Region	Coal Field	Twp., Rng.	Geologic Formation	Producing Bed Names	Seam Thickness	BTU Avg. Shipped	Mine Type	Mining Method	2006 Prod. (tons)	Dec 2006 Miners	Shipment Method
Delta	Colorado Energy Investments, LLC; Sentient Coal Resources, LLC	Bowie Resources Ltd.	Bowie #3	Uinta	Somerset	13S, 91W	Mesaverde	B	12-20 ft	11,650	U	Longwall, continuous	4,420,073	265	Rail
Gunnison	Oxbow Carbon and Minerals Holdings, Inc.	Oxbow Mining, LLC	Elk Creek	Uinta	Somerset	13S, 90W	Mesaverde	D2	D=6-19 ft. D2 seam minable is 14 ft.	12,375	U	Longwall, continuous	5,128,300	291	Rail
Gunnison	Arch Coal Inc.	Mountain Coal Company, Inc.	West Elk	Uinta	Somerset	13S, 90W	Mesaverde	E	12 ft	11,650	U	Longwall, continuous	6,039,936	371	Rail
La Plata	Alpha Natural Resources	National King Coal, LLC	King Coal	San Juan River	Durango	35N, 11W	Upper Menefee	Upper Bed	52-72 in.	12,800	U	Continuous	487,807	74	Truck
Garfield	Rhino Energy, LLC	McClane Canyon Mining, LLC	McClane Canyon	Uinta	Book Cliffs	7S, 102W	Mesaverde	Upper Cameo, Lower Cameo	Upper Cameo= 5-9 ft; Lower Cameo= 8-10 ft	10,475	U	Continuous	266,561	22	Truck
Moffat	Rio Tinto	Colowyo Coal Company, L.P.	Colowyo	Uinta	Danforth Hills	4N, 93W	Williams Fork-Fairfield Coal Group	A-F,X,Y	52.2 ft total; Y=4 ft, X=10.7 ft, A=2 ft, B=6.8 ft, C=6.4 ft, D=10.1 ft, E=6.8 ft, F=5.4 ft	10,453	S	Dragline, Shovels, Dozers	6,342,058	262	Rail
Moffat	PacificCorp/Tri-State G&T/Salt River	Trapper Mining, Inc.	Trapper	Green River	Yampa	6N, 90W	Williams Fork-Upper Coal Group	H, I, K, L, M, O	H=6 ft, I=5 ft, K=4 ft, L=4 ft, M=6 ft, O=10 ft	9,850	S	Dragline, Shovels, Hyd. Excav.	2,080,372	145	Truck
Montrose	Tri-State G&T Assoc.	Western Fuels Colorado, LLC	New Horizon	San Juan River	Nucla-Naturita	46N, 15W	Dakota	1, 2	Kd Upper= 0.80-1.5 ft; Kd Lower= 5.0-7.5 ft	11,680	S	Shovels, dozers	405,611	24	Truck
Rio Blanco	Deseret Generation & Transmission	Blue Mountain Energy, Inc.	Deserado	Uinta	Lower White River	3N, 101W	Williams Fork	B Seam	B= 7-16 ft., D= 6-8 ft.	10,000	U	Longwall, continuous	1,712,553	129	Rail
Routt	Peabody Energy	Twentymile Coal Co.	Twentymile (Foidel Creek)	Green River	Yampa	5N, 86W	Williams Fork-Middle Coal Group	Wadge	8.5-9.5 ft	11,250	U	Longwall, continuous	8,549,845	482	Rail, Truck
Routt	Peabody Energy	Seneca Coal Co.	Seneca II-W/foast (closed 2006)	Green River	Yampa	5N,87W	Williams Fork-Middle Coal Group	Wadge, Wolf Cr., Sage Cr.	Wadge= 9.9-12.2 ft (avg. 11.7 ft); Wolf Creeks= avg. 20.4 ft. Sage Creek= 3.4-5.4 ft (avg. 4.6 ft)	11,908-12,581	S	Dragline, loaders	57,131	0	Truck
Shaded items indicate new annual production record.									Mine Type abbreviations: U—underground mine, S—surface mine			Totals	35,490,337	2,065	

Uranium mining. Beginning in the early part of the twentieth century, the Rifle area in Garfield County was host to underground vanadium and uranium mining and two processing mills. In 1991, the Bureau of Land Management transferred 205 acres of land in Estes Gulch (approximately six miles north of the city of Rifle) to the Department of Energy to use as a disposal site for the tailings that had been produced and stored at the Old and New Rifle Uranium Mills. “The alluvial aquifer is contaminated by seepage from the former mill tailings piles at both former mill sites. Because of the large dilution by the river (at least a factor of 30,000), contaminants in alluvial groundwater discharging to the river are quickly diluted to background concentrations and no mill-related contamination has been detected in samples of Colorado River water collected at or downstream from the sites. “ (Rifle, Colorado, Processing Sites and Disposal Site. U.S. Department of Energy Office of Legacy Management.)



Project Rulison. Named after the rural community of Rulison, Colorado, Project Rulison was a 43-kiloton underground nuclear detonation that took place on September 10, 1969, about 8 miles SE of the town of Grand Valley, Colorado (now Parachute, Colorado) in Garfield County. It was part of the Operation Mandrel weapons test series as well as the Operation Plowshare project which explored peaceful uses of nuclear explosions. The peaceful aim of Project Rulison was to determine if natural gas could be easily liberated from underground regions. The test, was performed by the Atomic Energy Commission and two corporate partners, CER Geonuclear and the Austral Oil Company, at the bottom of an 8,426 foot deep shaft. The blast was marginally successful in causing the gas to collect in the cavity and fissures produced by the bomb; however, the gas was too radioactive to be sold commercially. Another nuclear-device gas stimulation test, called Rio Blanco, was performed nearby in 1973.

The surface of the site began to be cleaned up by the Department of Energy in the 1970s, and was completed in 1998. A buffer zone put in place by the state of Colorado still exists around the area. A January 2005 report by the DOE stated that radioactivity levels were normal at the surface and in groundwater.

OTHER ENVIRONMENTAL ISSUES

Although a complete discussion is beyond the scope of this report, it is important to note that there are other local and regional activities that can and do impact air quality or may contribute to human exposures to toxic materials. Among these are agricultural activities; seasonal open burning to clear ditches and prepare fields for planting, and spraying for weeds and insect pests takes place in many areas of Garfield County. Gravel mining along rivers to support local construction and traffic along the I-70 corridor and local roads contributes significantly to

airborne pollutants. Seasonal forest fires and weather inversion patterns also contribute to air quality issues that may impact the health of Garfield County residents.