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Water and Air Quality Issues in Oil and Gas  
Development: The Evolving Framework of  
Regulation and Management (Martz Summer  
Conference, June 5-6)

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2014

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### SLIDES: Oil, Gas and Water: Addressing Water Quantity and Quality Concerns

Laura Belanger

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# Oil, Gas and Water



## Addressing Water Quantity and Quality Concerns

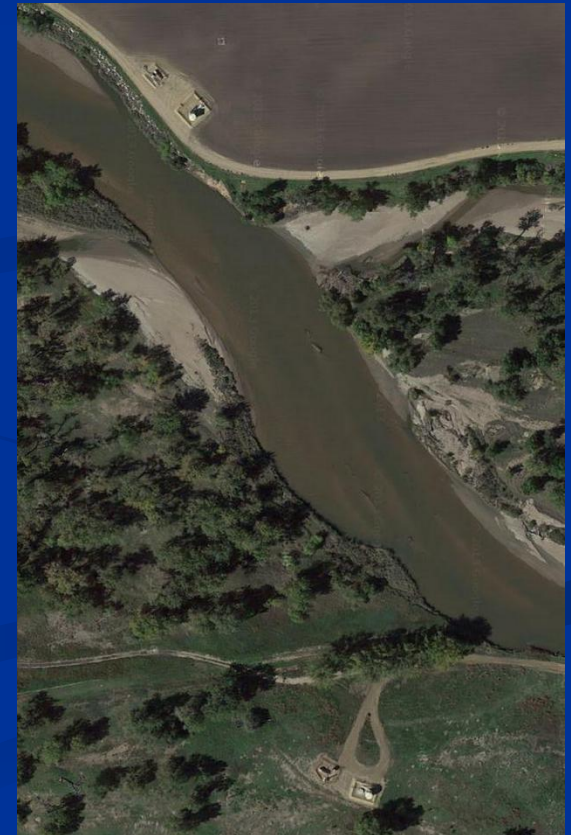
Laura Belanger, P.E.  
*Water Resources Engineer*  
Martz Summer Conference  
June 5, 2015



Western Resource Advocates

# Overview

- Common ground
- Role of regulations and transparency
- Water quality
- Water quantity/use
- Where we go from here



# Common Ground

- We all use energy
- We all desire livable communities, clean air and water, and a healthy environment
- Oil and gas development must be done right to minimize impacts and risk to our water, air, the environment and our communities



# Oil and Gas Regulations

- Strong regulatory framework and oversight are crucial
- Acknowledge there's much we don't know
- Data and transparency are key "to tackle areas of uncertainty and inform future action"
- Fact based discussions (beneficial to all)
- Default to protecting public health and the environment



# Water Quality

- Many concerns exist about impact of oil and gas development on groundwater and surface water
- Examples of Recent COGCC rulemakings:
  - 2011 Fracking Fluid Disclosure
  - 2012 Baseline Groundwater Monitoring
  - 2013 Improved Spill Reporting
- COGCC Staff September 2013 Floods Report & Recommendations



# COGCC Spills Database

- Surface spills are a documented risk



Incident Specifics	Number of Reports
Total Reports	2,500 (4/22/08 - 10/31/13)
<b>Reported as Berm Contained</b>	
Spills/Releases	951
Groundwater Impacted	129 (14% of berm contained)
<b>Reported as Not Contained within Berm</b>	
Spills/Releases	1,549
Groundwater Impacted	289 (19% of spills outside of berm)



# Spills and GW Impacts

- Examined 24 most recent reports with spills reported as berm contained and impacting GW.
- Initial groundwater concentrations exceeded WQ standards in 21\* spills

Benzene	
CWQCC Groundwater Standard	5 ug/l
Locations w/Concentrations	Number of Reports
Total Reports Examined	24
> Groundwater Standard	21*
> 100 ug/l	9
> 1,000 ug/l	4

\*Of the 24 spills: 1 report did not include WQ data, 1 liner-contained spill did not impact GW, 1 report documented GW concentrations below standards or reporting limits.





# CO Water Use: State Report\*

Sector	2010 Use (Acre-Foot/Yr) <sup>4</sup>	Percent of State Total
<b>Total</b>	<b>16,359,700</b>	
Agriculture	13,981,100	85.5%
Municipal and Industrial	1,218,600	7.4%
Total All Others	1,160,000	7.1%
Breakdown of "All Others"		
<b>Total All Others</b>	<b>1,160,000</b>	
Recreation	922,100	5.64%
Thermal		
<b>Hydraulic Fracturing</b>	13,900	0.08%
Snowmaking	5,300	0.03%
Coal, Natural Gas, Uranium, and Solar Development	5,100	0.03%
Oil Shale Development	0	0.00%

*Water needed for hydraulic fracturing is about 1/10th of 1% of total Colorado water use*

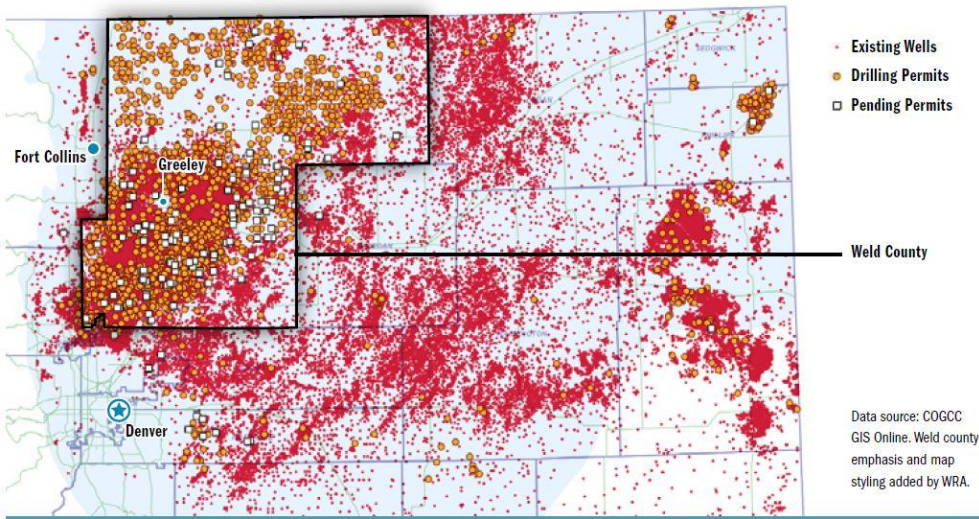


\* CDWR, CWCB, & COGCC Joint Report on *Water Sources and Demand for the Hydraulic Fracturing of Oil and Gas Wells in Colorado from 2010 through 2015*

# Colorado has 51,985 active wells

- In 2013: 1,864 wells drilled. 87% in two counties:
  - Weld = 66% (1,231 new wells, total of 21,161 active )
  - Garfield = 21% (390 new wells, total of 10,673 active)

Figure 3. Denver-Julesburg Basin Oil and Gas Facilities



Weld County and  
Northeast Colorado Wells

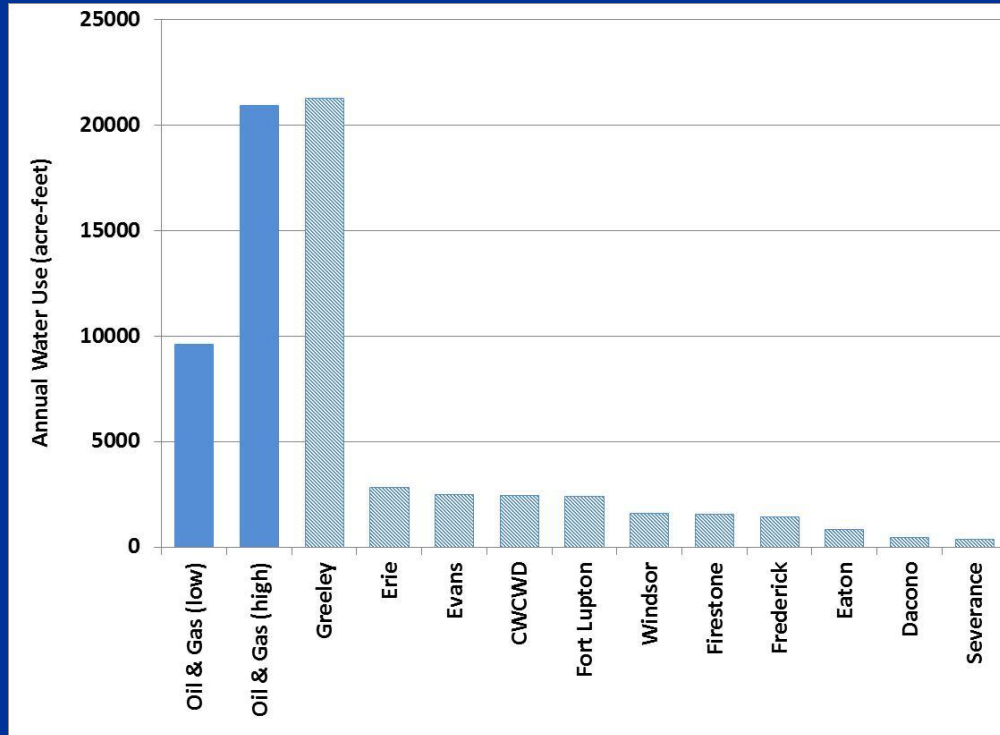


Garfield County  
Roan Plateau Area Wells

Image Courtesy of EcoFlight

# Local Impacts: Weld County

- WRA estimated 2011 use = 9,600 – 20,900 AF.
  - More water than every town in Weld County uses annually, except Greeley.



2011 New well development estimated water use compared to towns' and water providers' 2009 use\*.

\*2009 was a wet year resulting in somewhat lower than average use for most towns/providers.

Greeley, March 29, 2012 personal communication. Harvey Economics, 2011. "Water Supplies & Demands for Participants in the Northern Integrated Supply Project"



# WRA's Colorado New Well Water Use Estimate

- Range of 22,100 – 39,500 AF/yr
  - could serve: 44,200 – 79,000 families
  - with reuse: 66,400 – 118,400 families (166,000 – 296,000 people)
- U.S. Census 2010 populations:
  - Fort Collins = 143,986 (4th largest city)
  - Lakewood = 142,980 (5th largest city)
  - Larimer County = 299,630
  - Boulder County = 294,567
  - Douglas County = 285,465
  - Weld County = 252,825



*Note: This refers to residential needs only.*



# Transparency

[Click here to reset form](#)

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Form 5A  
Rev 6/12

**State of Colorado**  
**Oil and Gas Conservation Commission**

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 Phone: (303)894-2100 Fax: (303)894-2109

**COMPLETED INTERVAL REPORT**

(The Completed Interval Report, Form 5A, shall be submitted within thirty (30) days of completing a

Total fluid used in treatment (bbl): \_\_\_\_\_

Total gas used in treatment (mcf): \_\_\_\_\_

Type of gas used in treatment: \_\_\_\_\_

Total acid used in treatment (bbl): \_\_\_\_\_

Recycled water used in treatment (bbl): \_\_\_\_\_

Fresh water used in treatment (bbl): \_\_\_\_\_

Total proppant used (lbs): \_\_\_\_\_

Fracture stimulations must be reported on [FracFocus.org](http://FracFocus.org)

Max pressure during treatment (psi): \_\_\_\_\_

Fluid density at initial fracture (lbs/gal) \_\_\_\_\_

Min frac gradient (psi/ft): \_\_\_\_\_

Number of staged intervals: \_\_\_\_\_

Flowback volume recovered (bbl): \_\_\_\_\_

Disposition method for flowback: \_\_\_\_\_

Rule 805 green completion techniques were utilized:

Reason why green completion not utilized: \_\_\_\_\_

Tubing Size: \_\_\_\_\_ Tubing Setting Depth: \_\_\_\_\_ Tbg Setting Date: \_\_\_\_\_ Packer Depth: \_\_\_\_\_

**Formation Treatment** Treatment Type: \_\_\_\_\_

Perforations Top: \_\_\_\_\_ Bottom: \_\_\_\_\_ No. Holes: \_\_\_\_\_ Hole Size: \_\_\_\_\_ Open Hole:

Provide a brief summary of the formation treatment: \_\_\_\_\_ Treatment Dates: Start: \_\_\_\_\_ End: \_\_\_\_\_

Total fluid used in treatment (bbl): \_\_\_\_\_

Total gas used in treatment (mcf): \_\_\_\_\_

Type of gas used in treatment: \_\_\_\_\_

Total acid used in treatment (bbl): \_\_\_\_\_

Recycled water used in treatment (bbl): \_\_\_\_\_

Fresh water used in treatment (bbl): \_\_\_\_\_

Total proppant used (lbs): \_\_\_\_\_

Fracture stimulations must be reported on [FracFocus.org](http://FracFocus.org)

Max pressure during treatment (psi): \_\_\_\_\_

Fluid density at initial fracture (lbs/gal) \_\_\_\_\_

Min frac gradient (psi/ft): \_\_\_\_\_

Number of staged intervals: \_\_\_\_\_

Flowback volume recovered (bbl): \_\_\_\_\_

Disposition method for flowback: \_\_\_\_\_

Rule 805 green completion techniques were utilized:

Reason why green completion not utilized: \_\_\_\_\_

**Test Information**

Test Date: \_\_\_\_\_ Bbls Oil: \_\_\_\_\_ Mcf Gas: \_\_\_\_\_ Bbls Water: \_\_\_\_\_ Test Hours: \_\_\_\_\_

Calculated 24 Hour Rate: Bbls Oil: \_\_\_\_\_ Mcf Gas: \_\_\_\_\_ Bbls Water: \_\_\_\_\_ GOR: \_\_\_\_\_

Test Method: \_\_\_\_\_ Casing PSI: \_\_\_\_\_ Tubing PSI: \_\_\_\_\_ Choke Size: \_\_\_\_\_

Gas Disposition: \_\_\_\_\_ Gas Type: \_\_\_\_\_ BTU Gas: \_\_\_\_\_ API Gravity Oil: \_\_\_\_\_

**Formation Abandonment**

Reason for Non-Production: \_\_\_\_\_

Date Formation Abandoned: \_\_\_\_\_ Squeezed: Yes  No  If yes number of sacks cement: \_\_\_\_\_

Bridge Plug Depth: \_\_\_\_\_ Sacks of cement on top of bridge plug: \_\_\_\_\_ **Attach wireline and cement job summary.**

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct and complete.

Print Name: \_\_\_\_\_ Email: \_\_\_\_\_

Signature: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_



# Where we go from here

- Regulations must continue to adapt in response to technology and state of knowledge
- Data collection and dissemination “to tackle areas of uncertainty and inform future action”
- Continue/increase information sharing between states and federal agencies about what’s working
- Provide sufficient resources for oversight and enforcement



# Thank you

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