Colorado State University

Hydraulic Fracturing and Water in Colorado: Can They Co-exist?

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Urban Development and Water in Colorado: Can They Co-exist?

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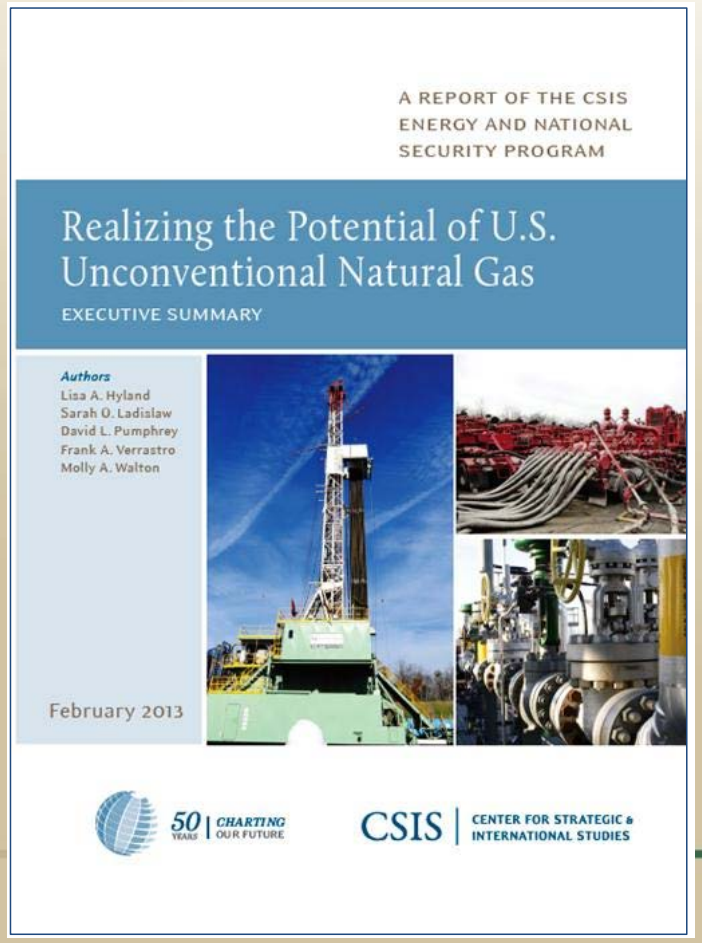
Center for Strategic and International Studies

Washington D.C.

Strategic insight, bipartisan policy



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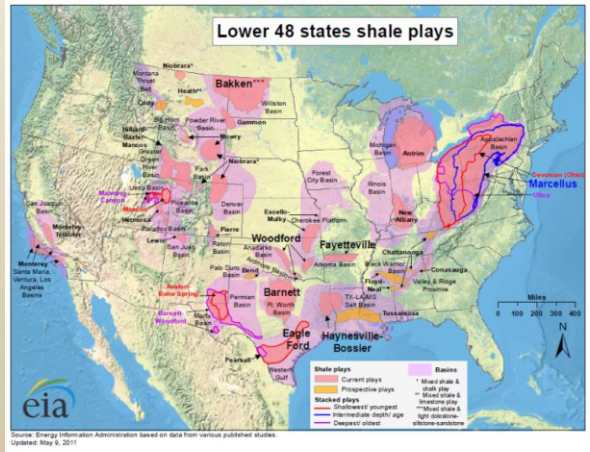
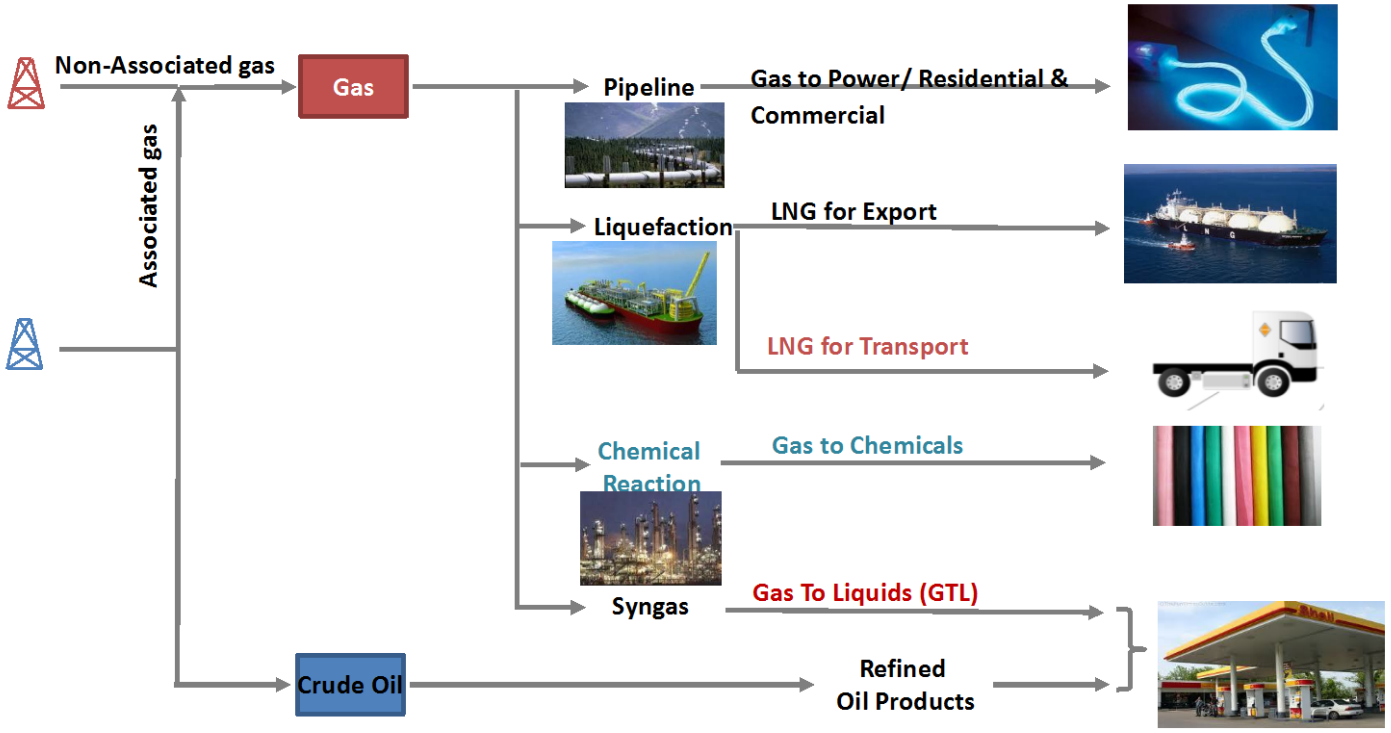


Key Finding 1: Resource base is enormous and readily available but industry and regulators are in the early stages of learning how to optimize the value of the resource.

Key Finding 2: Availability of relatively affordable natural gas can create jobs, spur economic growth and support important manufacturing sectors.

Key Finding 3: Several key domestic energy and environmental policies will drive greater U.S. domestic gas consumption and, along with natural gas exports, can provide an important stabilizing element for gas development.



Possible Gas Pathways

Key Finding 4: Development risks are manageable today but understanding risks and evolving cost-effective risk management approaches is a long term, continuous process.

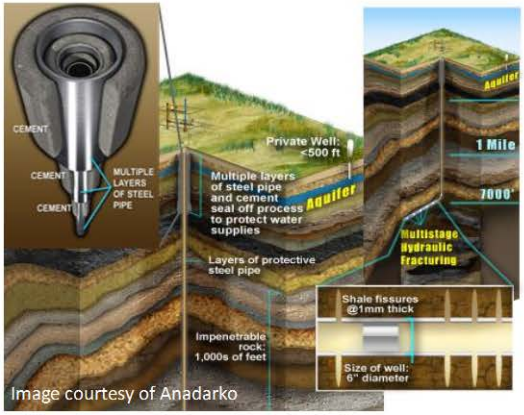
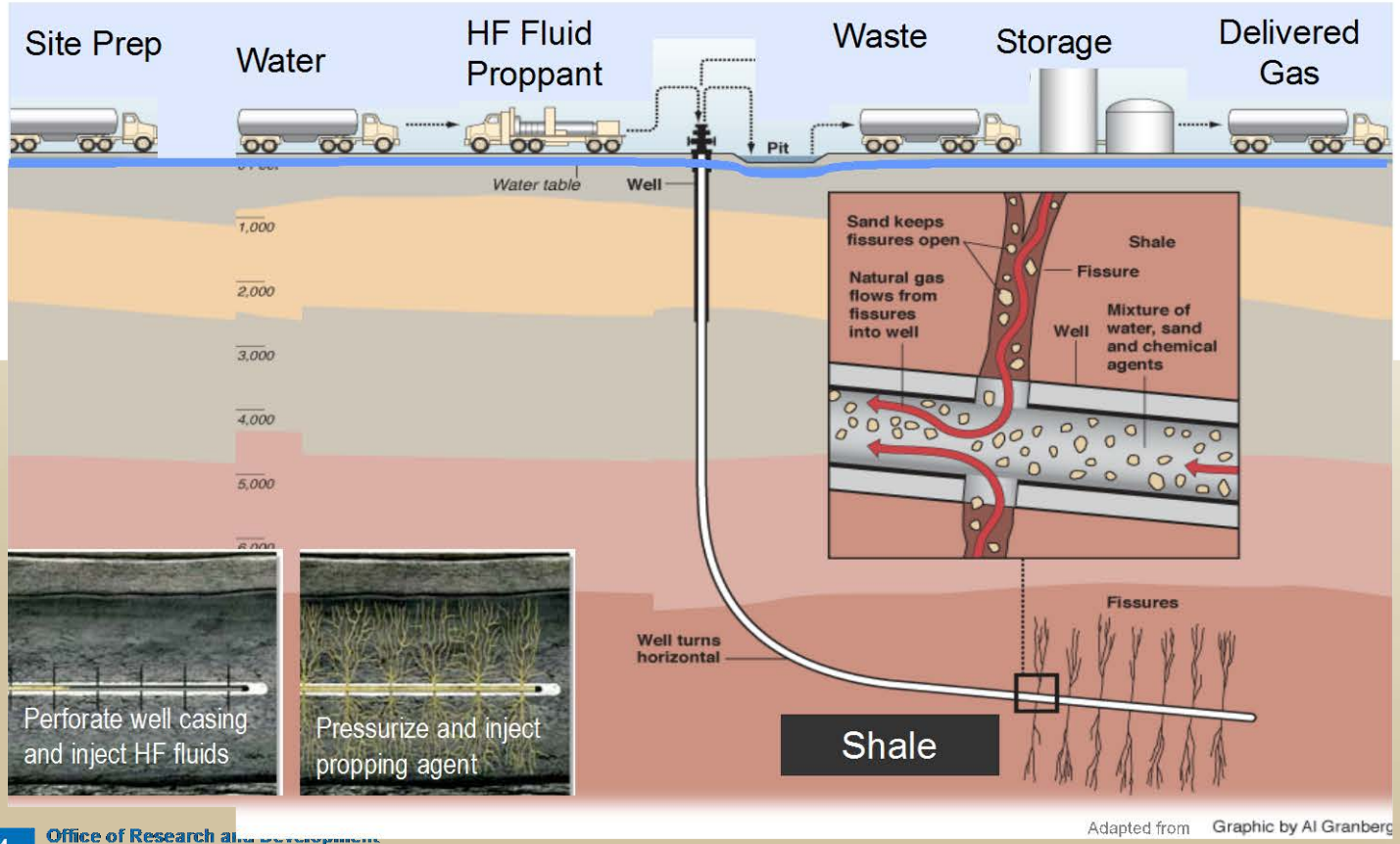


Image courtesy of Anadarko

Key Finding 5: Technology innovation is key to production, risk management and demand.

Key Finding 6: Public acceptance of unconventional gas development is a critical issue and the ability to manage risks must be demonstrated.

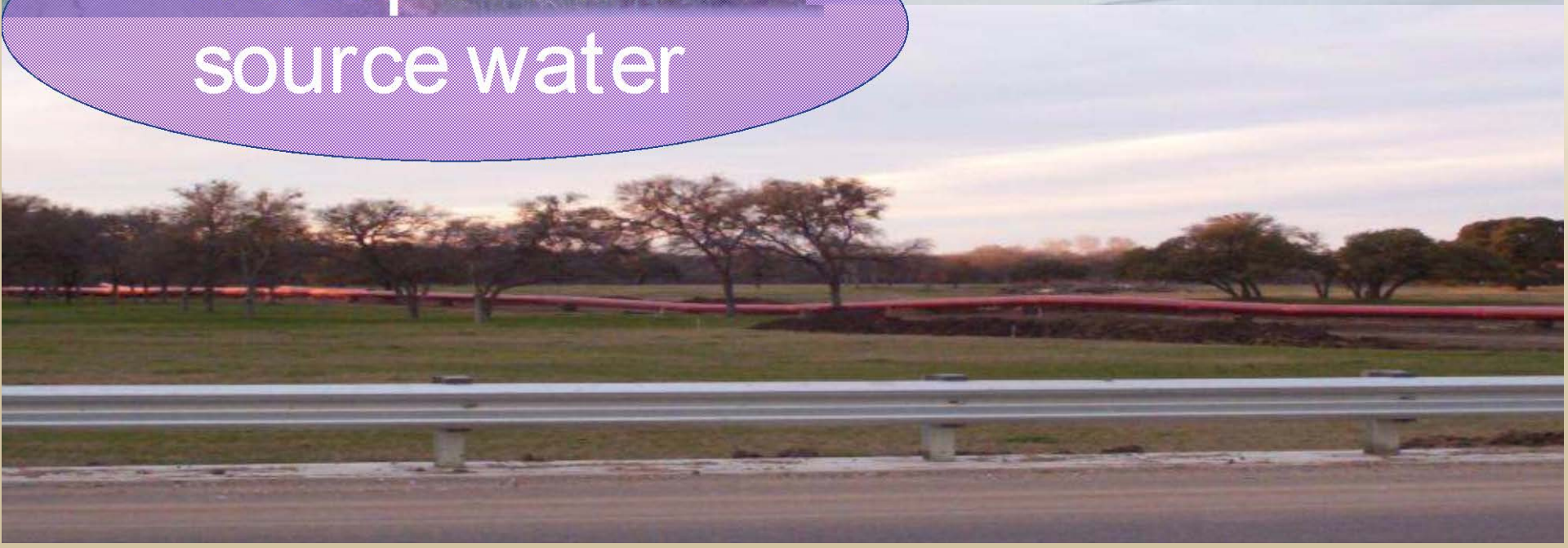
Definition of Hydraulic Fracturing Lifecycle



Find the source water

- City Water
- Ponds
- Lakes
- Rivers/Streams
- Municipal Waste
- Frac flowback

Transport the source water



Store the source water


Hydrofrac the well


Collect The Brine

Transport the Brine

Disposal/Reuse of the brine

- Disposal Wells
- Treatment Plants
- Land Apply
- Recycle/Reuse

RISKS

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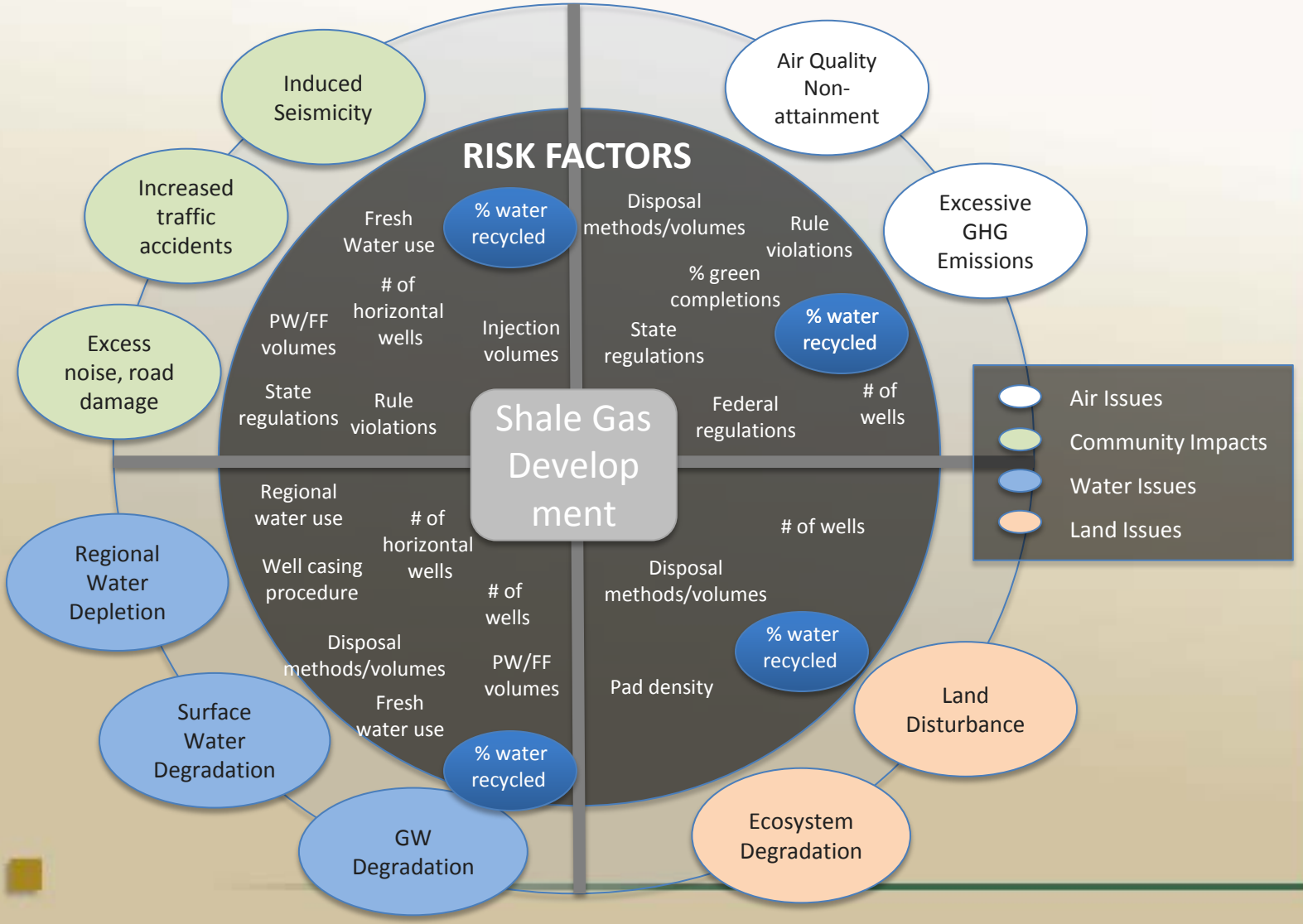

WESTERN RESOURCE ADVOCATES
Protecting the West's land, air, and water

FACT SHEET: *Fracking Our Future: Measuring Water & Community Impacts from Hydraulic Fracturing*

- **Annual Water Requirements for Fracking[1] in Colorado:**
  - 22,100 to 39,500 acre-feet (AF).
  - Enough water for 66,400 to 118,400 homes in Colorado.
  - Could serve 166,000 to 296,100 people for a year.
    - 166,000 is slightly more than the entire population of the City of Ft. Collins, CO (Colorado's 4th largest city).
    - 296,100 is similar to the entire populations of either Douglas, Boulder, Larimer or Weld counties in Colorado, and is more than the populations of cities like Buffalo, New York or Orlando, Florida.
  - In Weld County, CO, it is estimated that water used annually for new oil and gas well development is equal to one- to two-thirds of total public and domestic water use in the county.
  - Volume is similar to several large new proposed water projects.

- **Water Use for Fracking is 100% Consumptive**
  - Roughly 90-95% of residential water used indoors returns to a wastewater treatment plant and is ultimately released to streams or reused.

- **Reports on Water Use Per Frack Job Vary Widely:**
  - Niobrara Formation (Northern Colorado, Chesapeake Energy): 4 million gallons (12.28 AF)
  - Colorado Oil and Gas Association (COGA) Report: 1 to 5 million gallons (3.07 – 15.34 AF)
  - CWCB, COGCC, DWR[2] Report: 1.6 million gallons (5.01 AF) in 2011[3]
  - In addition to water used for fracking, wells must first be drilled:
    - Chesapeake Energy estimates at 300,000 gallons (0.92 AF)
    - COGA estimates at up to 600,000 gallons (1.84 AF)

- **Your Water is Driving Away**
  - A recent report completed for Douglas County, CO. estimates 11,040 loaded truck trips for one well pad (containing six wells) over a 265 day period.
    - 6,000 trips were made to haul fracking water
    - 3,000 trips were for wastewater disposal
  - Bureau of Land Management report[4] estimates 1,160 truck visits are required to develop each well

[1] Volume includes drilling of wells.
[2] Colorado Water Conservation Board, Colorado Oil & Gas Conservation Commission, Department of Water Resources
[3] Average water use per well water use calculated by WRA using data provided by the State of Colorado
[4] Bureau of Land Management's Roan Plateau Resource Management Plan Amendment and Environmental Impact Statement

Measuring Water
& Community Impacts

Water Sources and Demand for the Hydraulic Fracturing of Oil and Gas Wells in Colorado from 2010 through 2015

Colorado Division of Water Resources
Colorado Oil and Gas Conservation Commission
Colorado Water Conservation Board

Sector	2010 Use (Acre-Feet/Yr)[4]	Percent of State Total
Total	**16,359,700**	
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"		
Total All Others	**1,160,000**	
Recreation	923,100	5.64%
Large Industry	136,000	0.83%
Thermoelectric Power Generation	76,600	0.47%
Hydraulic Fracturing	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%

http://cogcc.state.co.us/Library/Oil_and_Gas_Water_Sources_Fact_Sheet.pdf