



## An Overview of Water Concerns with Unconventional Oil and Gas Fields

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### ABSTRACT

For 70 years, hydraulic fracturing (HF) has occurred. Recently in the last 15 years, HF has become a public concern due to the great increase in the volume of water and other chemicals used due to long horizontal holes drilled. These concerns are: (1) water supply for HF; (2) chemical contamination possible from compounds used for HF; and (3) disposal of HF flow-back water and produced water. This work is an examination of these concerns.

The first concern is that HF uses large volumes of water. The average water volume used per well in the United States for HF increased from 2.5 million gallons (MG) in 2012 to 11.0 MG in 2018. Between 2012 and 2018, water used per well increased by approximately 200% for the Haynesville, and over 1000% for the Wolfbone and Wolfberry Shales, Permian Basin, Texas. Water volume used is mainly a concern during droughts, 2010–2012, for the Haynesville or in semi-arid or arid regions for shales in Utah, Colorado, Utah, or southwest Texas.

The second concern is HF chemicals used. Although typically, the HF solution is composed of 90% water and 9.5% sand/quartz and 0.5% other chemical additives. It is the, over 2000 additives are in HF solution including hundreds that are possible human carcinogens or hazardous pollutants that is a concern. In addition, to compounds with known health impacts there are many unknown compounds, typically 4 to 8 for Haynesville HF solution. What is their impact on human health?

The third concern is disposal of HF solution and produced water possibly reaching groundwater by four different ways. (1) direct flow from fracture zone to aquifer, (2) blowout at any point from surface to pay zone, (3) surface spills, and (4) flow fracture zone or injection zone to aquifer through the 2 to 50% of wells with poor cement jobs.