

WATER USE IN EAGLE FORD DEEP SHALE EXPLORATION



FACT SHEET

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Eagle Ford Deep Shale Water Use

Water is an essential component of Chesapeake Energy Corporation's deep shale development. During the drilling process, Chesapeake uses a mixture of clay and water to carry rock cuttings to the surface, as well as to cool and lubricate the drillbit. Drilling a typical Chesapeake Eagle Ford deep shale well requires approximately 125,000 gallons of water.

Water is also used in hydraulic fracturing, where a mixture of water and sand is injected into the deep shale at a high pressure to create small cracks in the rock which allow natural gas and oil to flow more freely. Fracturing a single Chesapeake Eagle Ford deep shale well requires an average of 4.8 million gallons of water.

Water Use Consumption

The volume of water necessary to drill and fracture Eagle Ford deep shale wells represents a very small percentage of the total water resources used in the Eagle Ford Shale area in South Texas. According to the Texas Water Development Board, the total water use in this area in 2008 was approximately 64.8 billion gallons. The primary water users in this Eagle Ford Shale area are irrigation (approximately 70%) and municipal/public water supply

How much is 4.9 million gallons?

The 4.9 million gallons of water needed to drill and fracture an Eagle Ford Shale well is equivalent to the amount of water:

- That flows, on average, past the City of Laredo in the Rio Grande River every 3.6 minutes
- **Used to irrigate 11.6 acres of vegetables in a season**
- Used by the City of San Antonio in approximately 17.7 minutes

While these uses represent continuing consumption, the water used to produce tight oil and gas from a deep shale well is a one-time use.

KEY POINTS

- Water resources are protected through stringent federal, state and local permitting processes.
- Water is essential for Eagle Ford Shale development.
- Eagle Ford Shale drilling and hydraulic fracturing uses a small amount of water compared to other uses within the geographic area, and does not represent a long-term commitment of the resource.

(approximately 26%). Assuming that Chesapeake will drill approximately 375 wells per year, the amount of water used will be only account for approximately 3% of the total water use of the seven-county area. Water used in Chesapeake's Eagle Ford Shale operations differs most notably from all other uses because it is temporary, occurring only once during the drilling and completion phases of each well. Use of this water does not represent a long-term commitment of the resource.

Water Sources

Chesapeake utilizes several sources of water in its Eagle Ford Shale exploration, including municipalities, rivers, ponds, lakes and groundwater wells. Many times, existing water right holders are willing to temporarily provide available water to Chesapeake. Chesapeake is also currently reviewing the use of a variety of other water resources, such as discharge water from industrial or city wastewater treatment plants, marginal (saline) groundwater and reuse of fracturing water. Water is typically transported to a drilling location by truck or by using temporary pipelines. The water is then stored in tanks or impoundments prior to use. Due to the diverse geographic area overlying the Eagle Ford Shale, the overall mix of water sources used depends on the region and the availability of sources near drilling sites.

Chesapeake is continuously reviewing the use of a variety of water sources.

Water Requirements for Various Energy Sources

Energy Resource ¹	Range of Gallons of Water Used per MMBTU of Energy Produced
Eagle Ford Shale Natural Gas	1.25 ²
Conventional Natural Gas	1 – 3
Coal (no slurry transport)	2 – 8
Coal (with slurry transport)	13 – 32
Nuclear (uranium ready to use in a power plant)	8 – 14
Chesapeake Deep Shale Oil	7.96 – 19.25 ³
Conventional Oil	8 – 20 ³
Synfuel - Coal Gasification	11 – 26
Oil Shale Petroleum	22 – 56
Oil Sands Petroleum	27 – 68
Synfuel - Fisher Tropsch (from coal)	41 – 60
Enhanced Oil Recovery (EOR)	21 – 2,500
Biofuels (Irrigated Corn Ethanol, Irrigated Soy Biodiesel)	> 2,500

¹Source: "Deep Shale Natural Gas: Abundant, Affordable, and Still Water Efficient", GWPC, 2010.

²The transport of natural gas can add up to two gallons per MMBTU.

³Includes refining which consumes a major portion (90%) of the water needed (7-18 gal per MMBtu).

Water Regulations

Regardless of the source, water used in Chesapeake's drilling and fracturing process is purchased and, as required, properly permitted. This ensures that water used for these processes does not interfere with the available supply for other users.

In the Eagle Ford Shale, Chesapeake works closely with entities such as the Texas Commission on Environmental Quality, Texas Water Development Board, area groundwater conservation districts, Watermasters, local landowners and municipalities on its proposed water use.

Given its relatively minor water usage, Chesapeake's deep shale development is consistent with the nation's energy/water strategy, by making a positive energy and economic contribution at a relatively low cost to the overall water supply. Chesapeake's deep shale exploration has the potential to supply decades of natural gas and oil for the U.S., while using less water than other currently available viable energy sources.

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The Texas Ground Water Association estimates that one acre-foot (325,871 gallons) of water used for Eagle Ford Shale well development has a gross revenue potential of approximately \$2,080,000/acre-foot as compared to one acre-foot of water used to irrigate corn, peanuts or coastal hay, which has an estimated gross revenue potential of about \$250/acre-foot of water.



Information Sources

- Argonne National Laboratory
- Ground Water Protection Council (GWPC)
- Oilshalegas.com
- Oil Technology Institute
- San Antonio Water System: www.saws.org
- Sandia National Laboratory
- Society of Petroleum Engineers
- Texas Commission on Environmental Quality (TCEQ)
- Texas Ground Water Association
- Texas Water Development Board (TWDB)
- U.S. Department of Energy (DOE)
- U.S. Geological Survey

About Chesapeake

Chesapeake Energy Corporation is the second-largest producer of natural gas, a Top 15 producer of oil and natural gas liquids and the most active driller of new wells in the U.S. Headquartered in Oklahoma City, the company's operations are focused on discovering and developing unconventional natural gas and oil fields onshore in the U.S. Chesapeake owns leading positions in the Barnett, Haynesville, Bossier and Marcellus natural gas shale plays and in the Granite Wash, Cleveland, Tonkawa, Mississippi Lime, Bone Spring, Avalon, Wolfcamp, Wolfberry, Eagle Ford, Niobrara, Three Forks/Bakken and Utica unconventional liquids plays. The company has also vertically integrated its operations and owns substantial midstream, compression, drilling, trucking, pressure pumping and other oilfield service assets. For more information on Chesapeake environment initiatives, visit the environment section of CHK.com, HydraulicFracturing.com, NaturalGasAirEmissions.com, NaturalGasWaterUsage.com, AskChesapeake.com or FracFocus.com.