

Learning Objectives:

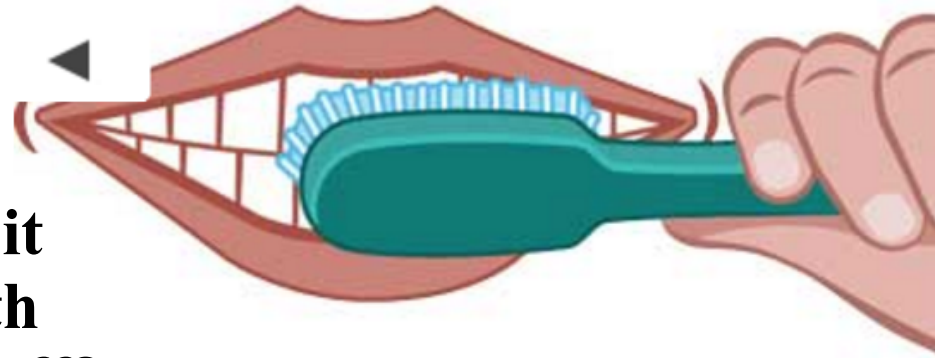
- I can identify and form an opinion on current fracking issues.

Bellringer **Review**:

- What is an aquifer?
- How can our waste or pollution affect our drinking water?

Check for Understanding Questions:

- Why is groundwater so important?
- What are some of the pros and cons to fracking?
Name at least one for each.

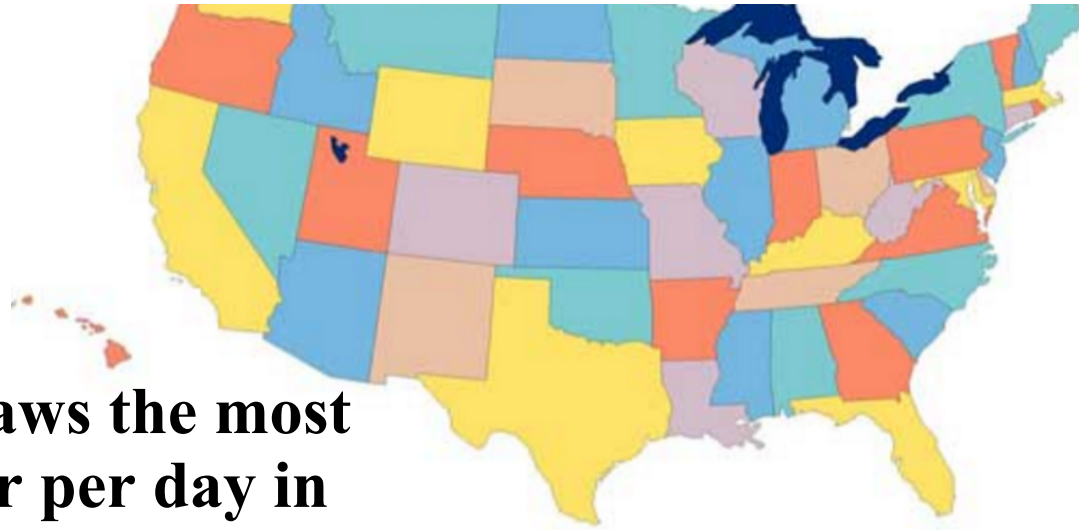


How much water does it take to brush your teeth with the water turned off?

- A. 5 gallons
- B. 2 gallons
- C. Less than 1 gallon
- D. 10 gallons

C. Less than 1 gallon

Turning the water off when you brush your teeth is an easy way to conserve water in your home, along with taking five minute showers, fixing leaky faucets, running full loads in the dish and clothes washer, and using water efficient fixtures and appliances.



What use withdraws the most total groundwater per day in the U.S.?

- A. Irrigation
- B. Public Supply
- C. Industry

A. Irrigation

Irrigation uses 53.5 million gallons of water per day, public supply 14.5 million gallons per day, and industry 3.1 million gallons per day.

Approximately how many gallons of water are used to produce a burger, fries, and soft drink?

- A. 35
- B. 3,000
- C. 250
- D. 1,400



D. 1,400



We "eat" a lot of water in the growing, processing, transporting, and cooking processes of our food.

How much do we depend on groundwater?

- Groundwater supplies drinking water for 51% of the total U.S. population and 99% of the rural population.
- Groundwater helps grow our food. 64% of groundwater is used for irrigation to grow crops.
- Groundwater is an important component in many industrial processes.
- Groundwater is a source of recharge for lakes, rivers, and wetlands.

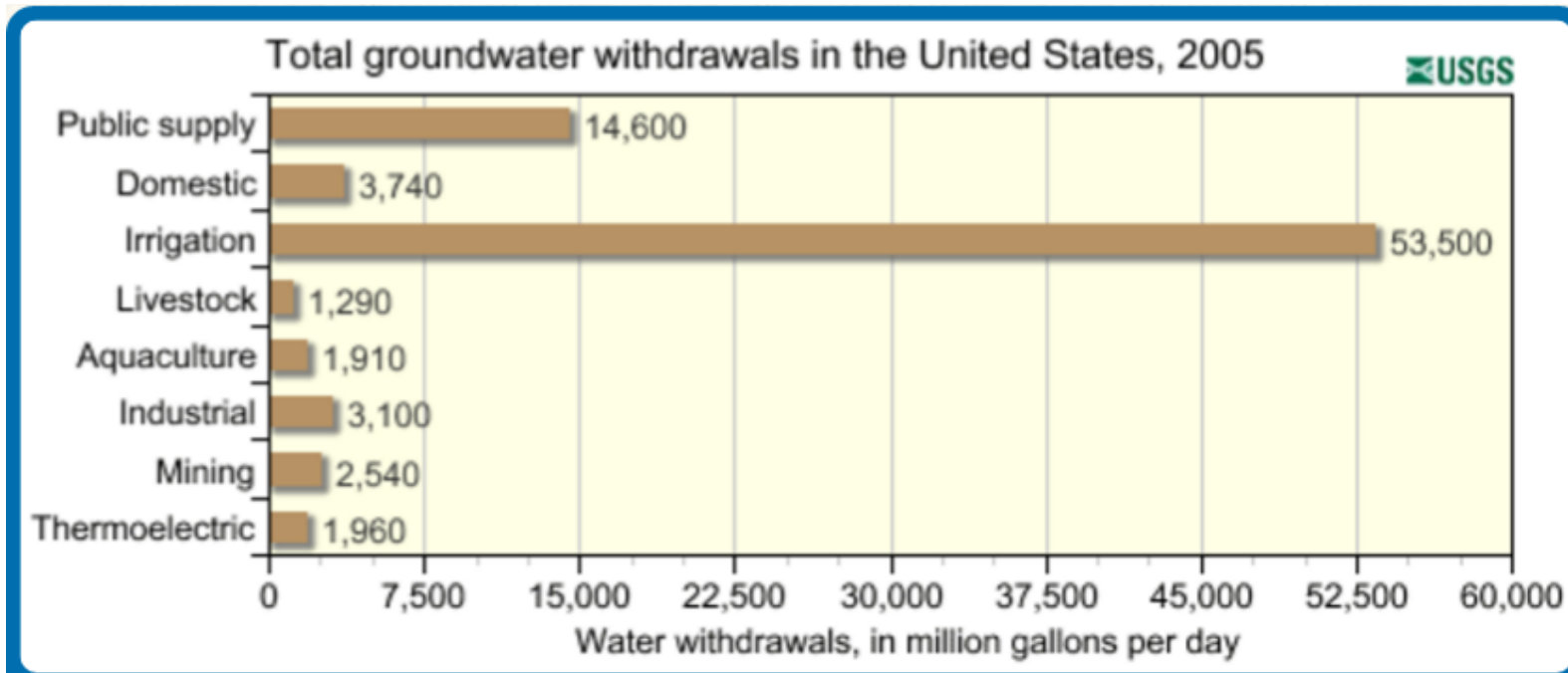


Image and figures courtesy of the U.S. Geological Survey

Groundwater Facts:

- > About 27 trillion gallons of groundwater are withdrawn for use in the U.S. each year.
- > A gallon of water weighs about 8 pounds.
- > The High Plains Aquifer covers eight states and 175,000 miles.
- > 26% of household water use is for flushing the toilet.
- > About 25% of all rainfall in the U.S. becomes groundwater.
- > Water is the only substance on Earth found naturally in three forms - solid, liquid, and gas.



In 2000, shale beds provided just 1 percent of America's natural gas supply. Today, that figure stands at nearly 56 percent for natural gas and 48 percent output for oil.

Most of that production increase is due to the growing popularity of hydraulic fracturing--known colloquially as "fracking"--a process used to release oil or gas from underground formations that are otherwise too difficult to mine. Over the past few years, advances in fracking technology have made tremendous reserves of natural gas in the United States economically recoverable for the first time. According to the Energy Information Administration, shale gas plays, or fields, in the United States--most notably the Marcellus, in Pennsylvania, West Virginia, and New York, and the Barnett, in Texas--are said to contain enough natural gas to power the country for 110 years. With the enticing specter of energy independence in the balance, some have argued that such efforts to recover natural gas need to be expanded. Activists concerned with fracking's potential environmental hazards view the process as a serious threat.

The process of fracking creates fractures that extend from wells into oil and gas formations by pumping highly-pressurized fluid--water, sand, ceramic beads, and a mixture of chemicals--into the oil or gas formation. As this fluid holds the underground fissures open, oil and gas flow up the well to the surface where they can be recovered. Water makes up an overwhelmingly high percentage of fracking fluid, but a congressional Democrat report released in April identified about 750 chemicals that have also been used in the process, 29 of which are either likely or known carcinogens. That fluid also flows back up the well, and is stored in open pits until it can be sent to a treatment plant. Depending upon local geology, a variable amount of fracking fluid remains in the ground after a well has run dry. Likewise, fracking is known to produce airborne pollutants like methane, benzene, and sulfur oxide, and the EPA has recently targeted this pollution and plans to set strict guidelines to reduce it.

Debate

We're going to have a debate.

- Read your article
- Form your opinion
- Debate

Debate

We're going to have a debate again.

- Read the opposing article
- Form your new opinion
- Debate

Check for Understanding Questions:

- What is an aquifer?
- How can our waste or pollution affect our drinking water?

Learning Objectives: Did you accomplish them?

- I can identify the permeability of different materials.

Self-Evaluation

- How well did you understand the material today?
(1-Lost, 2- understand, 3-can teach it)
- How well did you and your team members participate in class?
(1-didn't do anything, 2-Bare minimum, 3-fully participated)