

Lesson notes

Ground & Surface Water

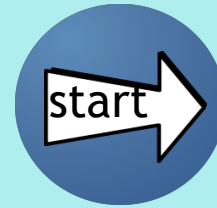
By Leslie Carter-Farley
Science Instructional Coach
MAJAL@JPSd

Key Concepts (from STEMScopes):

- A watershed is an area of land from which water flows into a larger body of water such as a river, lake, stream, ocean, or aquifer.
- Groundwater is obtained from aquifers, which are areas located underground where water is stored in the pore spaces of soil and rock.
- Human activity can contaminate water resources in a variety of ways. Excess nutrients, such as nitrogen and phosphorous found in fertilizers and human waste, can lead to large algal blooms, which quickly lower the oxygen levels of a body of water creating dead zones. Excessive pumping of groundwater from aquifers can cause subsidence, or sinking of Earth's surface.
- There are two classifications for human water pollution: point source and non-point source. With point source pollution, the source of chemicals or other contaminants is apparent, such as a wastewater treatment plant or a factory that releases waste directly into the water. With non-point source pollution, no single source of pollution is evident, but contaminants still exist, such as fertilizer or pet waste running off from suburban yards and into storm drains.

Fundamental Questions

- What is a watershed?
- What is the source of groundwater?
- How can human activity contaminate or deplete water resources?
- What is point source and non-point source pollution?



info

Part 1: What is it?



Ground & Surface Water

intro

Pre-Assessment

Pull

- _____ 1. Watersheds are important because they
- A. prevent surface run-off
 - B. increase the soil's pore space
 - C. remove salt from ocean water
 - D. prevent floods and provide fresh water



- _____ 2. Surface runoff comes from
- A. rivers and streams
 - B. water that soaks into the ground
 - C. rain and melted snow
 - D. reservoirs



- _____ 3. Which of the following statements about the groundwater and surface water is correct?

- A. Groundwater can never become surface water.
- B. Surface water can become groundwater by soaking through soil and cracks in rocks.
- C. A spring is a place where surface water collects.
- D. Groundwater evaporates into the atmosphere.



- _____ 4. How is groundwater affected by the substances that people use in and around their homes and the things that they throw away?

- A. The substances can pollute surface water which can lead to groundwater pollution.
- B. These substances can cause groundwater pollution which leads to surface water pollution.
- C. They pollute rivers, lakes, and oceans.
- D. They affect the amount of groundwater available for drinking water.



pre-assess

Part 1--What is it?



Ground & Surface Water

part 1

What is groundwater?



groundwater

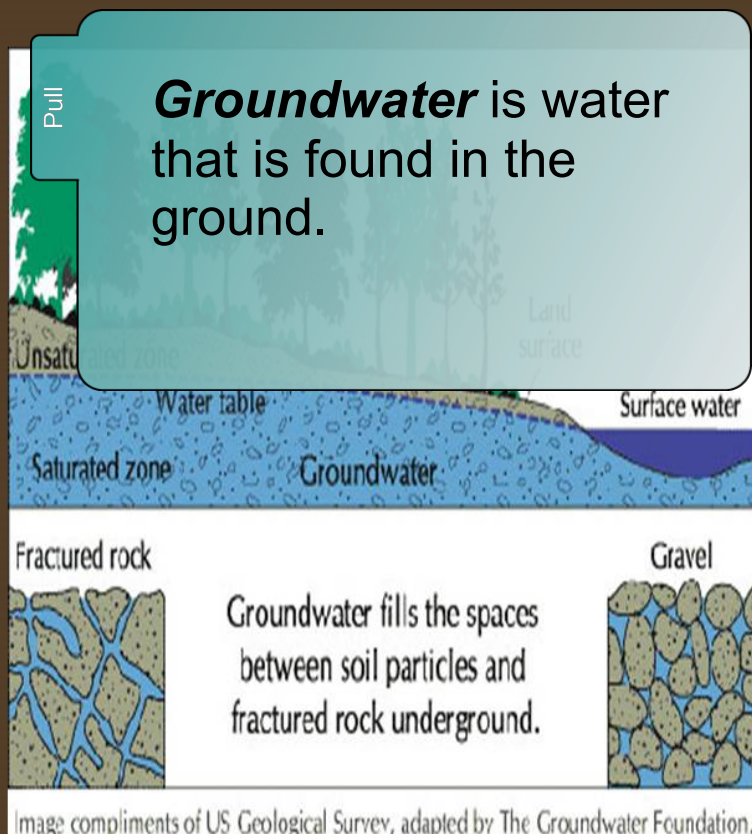


Image compliments of US Geological Survey, adapted by The Groundwater Foundation.

- Amazingly, many people use groundwater but don't even know it. In fact, half of everyone in the United States drinks groundwater everyday!
- Groundwater is even used to irrigate crops which grow food for tonight's dinner.

groundwater 2

Where does groundwater come from?

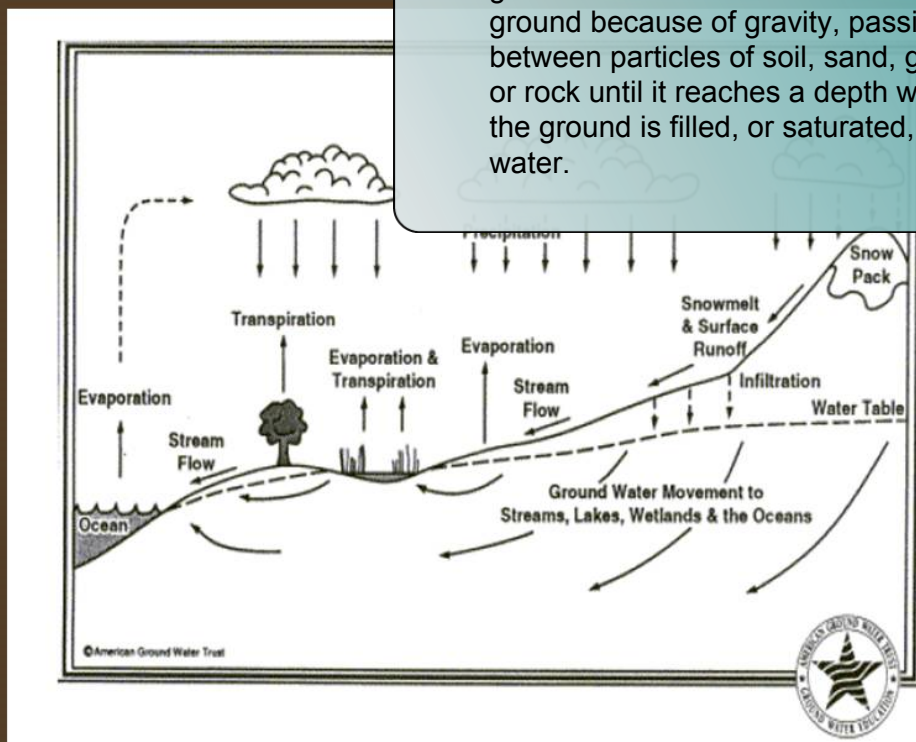


groundwater 3

• **Groundwater** comes from

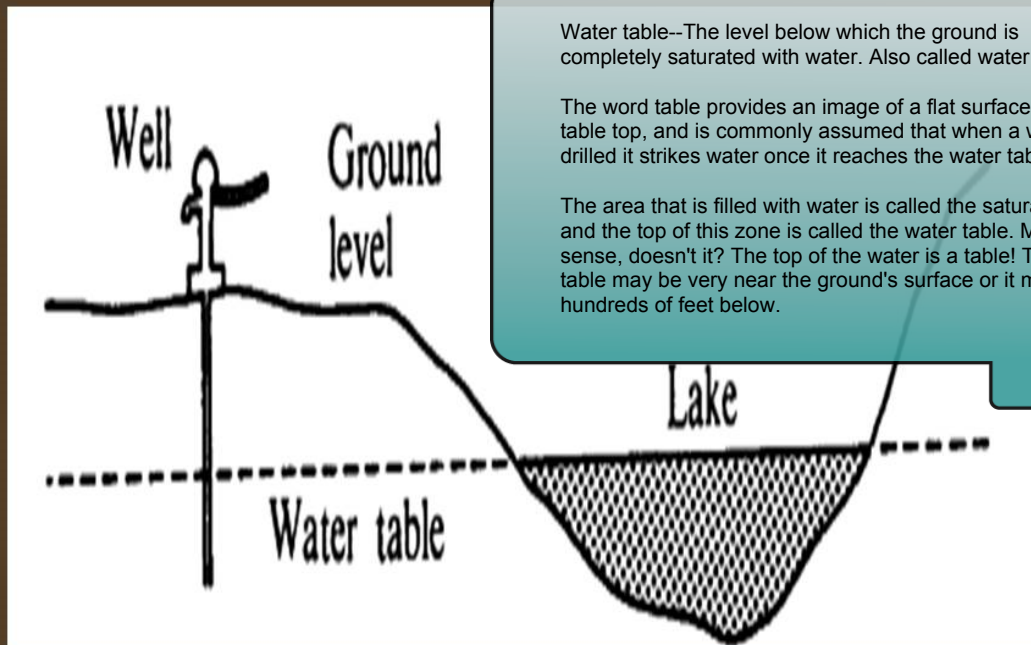
Groundwater comes from rain, snow, sleet, and hail that soaks into the ground. The water moves down into the ground because of gravity, passing between particles of soil, sand, gravel, or rock until it reaches a depth where the ground is filled, or saturated, with water.

Pull



groundwater 4

What is a water table?



Water table--The level below which the ground is completely saturated with water. Also called water level.

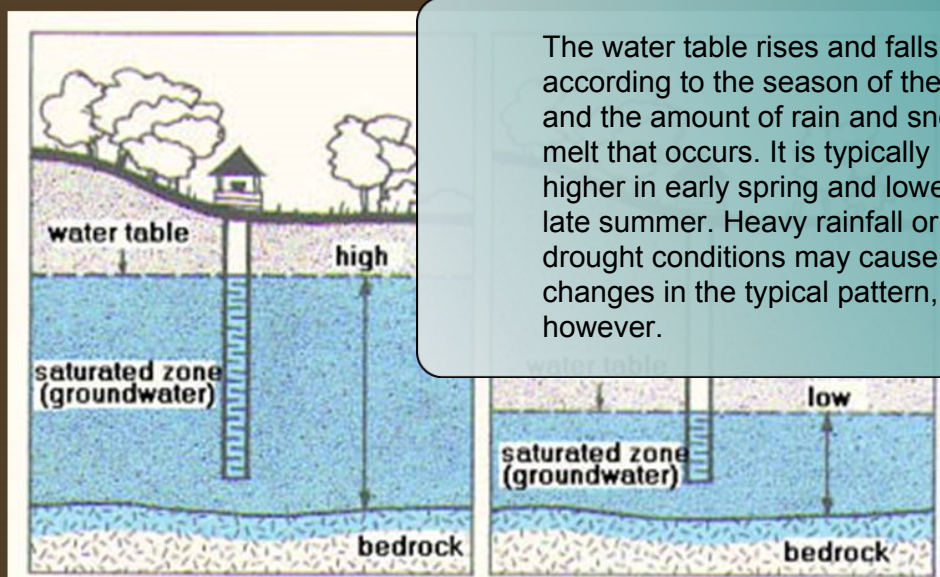
The word table provides an image of a flat surface, like a table top, and is commonly assumed that when a well is drilled it strikes water once it reaches the water table.

The area that is filled with water is called the saturated zone and the top of this zone is called the water table. Makes sense, doesn't it? The top of the water is a table! The water table may be very near the ground's surface or it may be hundreds of feet below.

Pull

water table

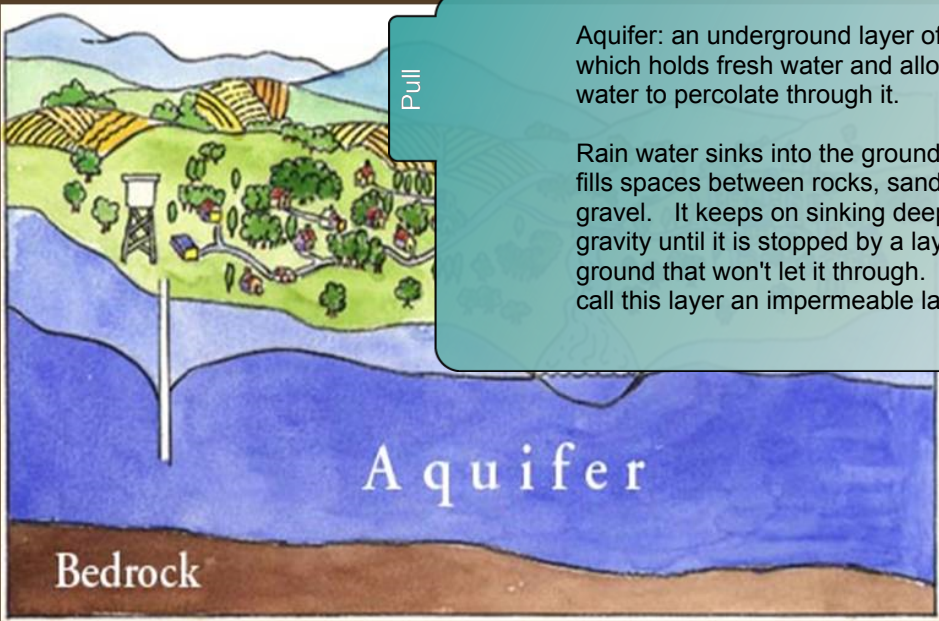
As seen here, the water table can rise and fall. List 2 reasons for the different levels of water.



The water table rises and falls according to the season of the year and the amount of rain and snow melt that occurs. It is typically higher in early spring and lower in late summer. Heavy rainfall or drought conditions may cause changes in the typical pattern, however.

water table 2

What is an aquifer?

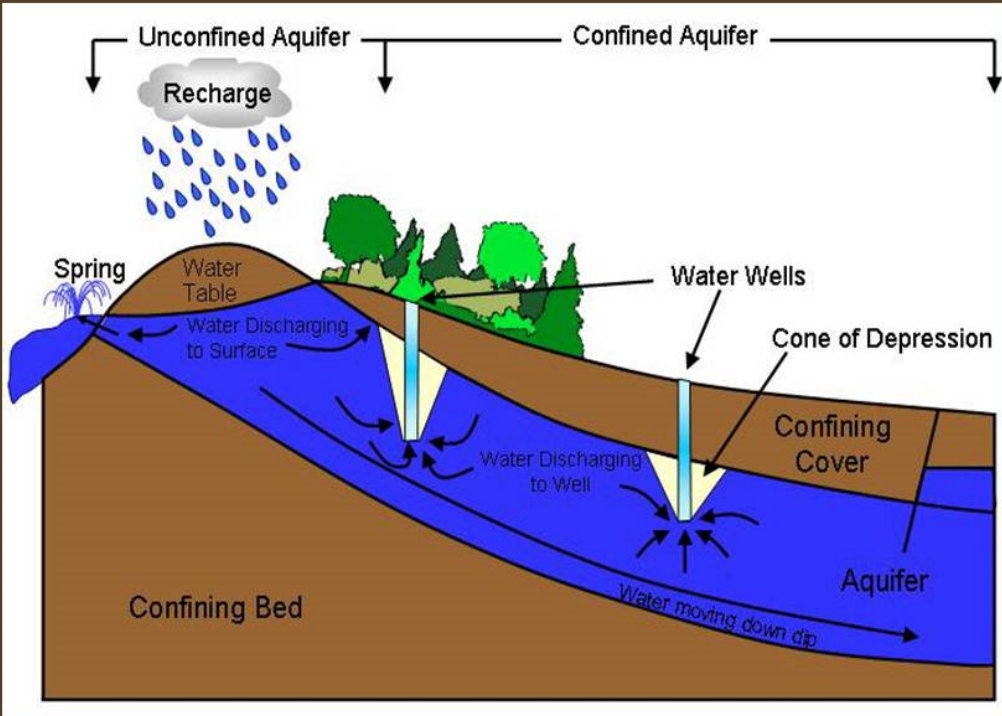


Aquifer: an underground layer of rock which holds fresh water and allows water to percolate through it.

Rain water sinks into the ground and fills spaces between rocks, sand, and gravel. It keeps on sinking deeper with gravity until it is stopped by a layer of ground that won't let it through. They call this layer an impermeable layer.

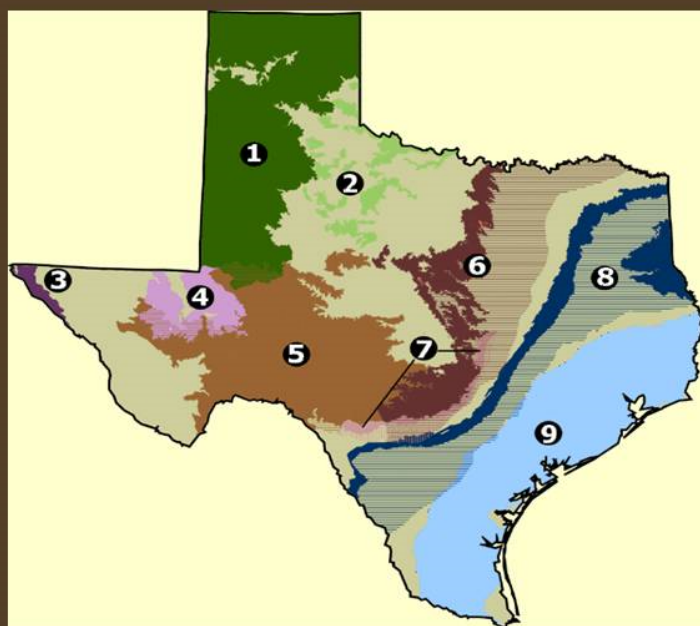
aquifer

Another example of an aquifer...



aquifer 2

AQUIFERS OF TEXAS



- 1. Ogallala Aquifer
- 2. Seymour
- 3. Hueco-Mesilla Bolson
- 4. Cenozoic Pecos Alluvium
- 5. Edwards-Trinity
- 6. Trinity
- 7. Edwards (BFZ)
- 8. Carrizo-Wilcox
- 9. Gulf Coast

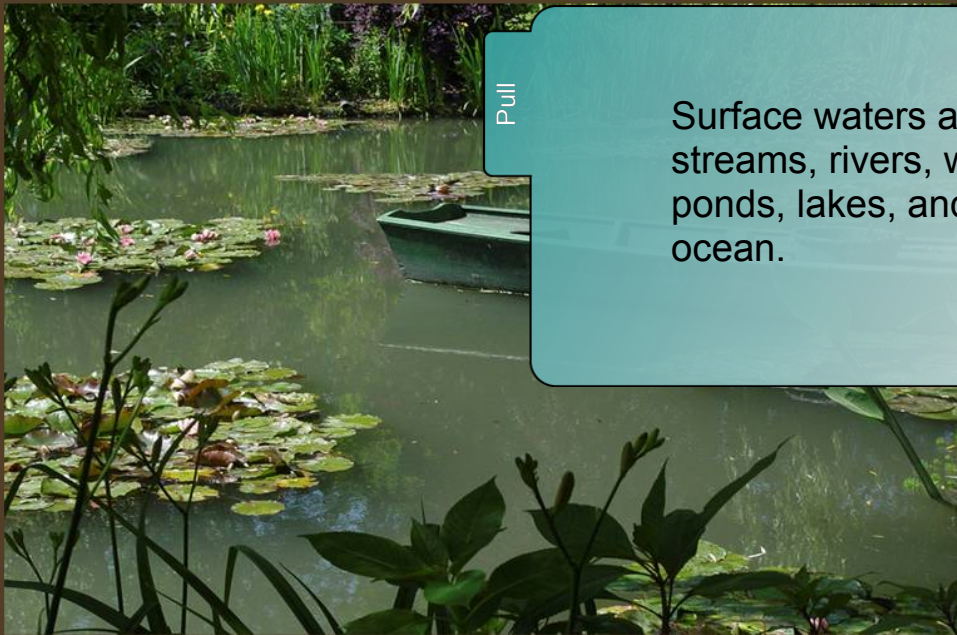
aquifers of Texas

What is surface water?



surface water

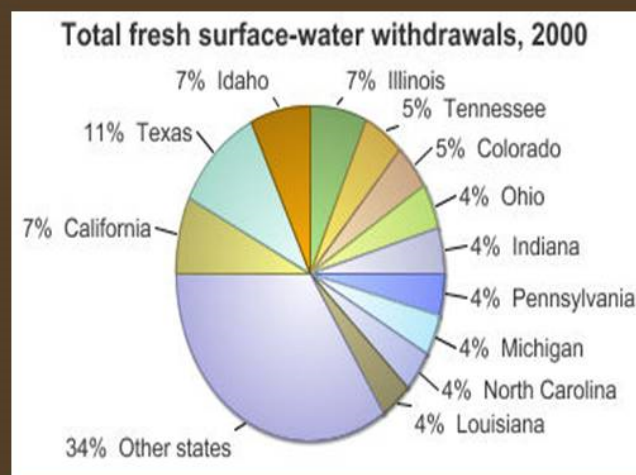
- List examples of where **surface water** may be found...



Pull

Surface waters are streams, rivers, wetlands, ponds, lakes, and the ocean.

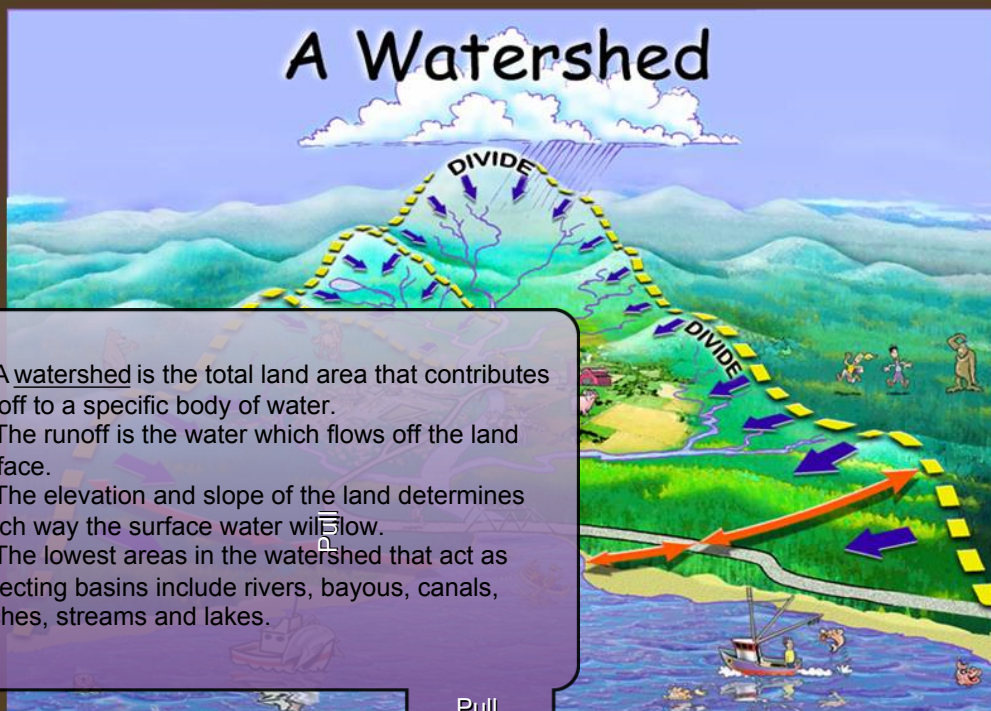
surface water 2



- Which state uses the most surface water for everyday needs?
- Why do you think this state uses so much water?
- Could the fresh surface water be completely depleted (used up)?
- As a result, what problems might occur?

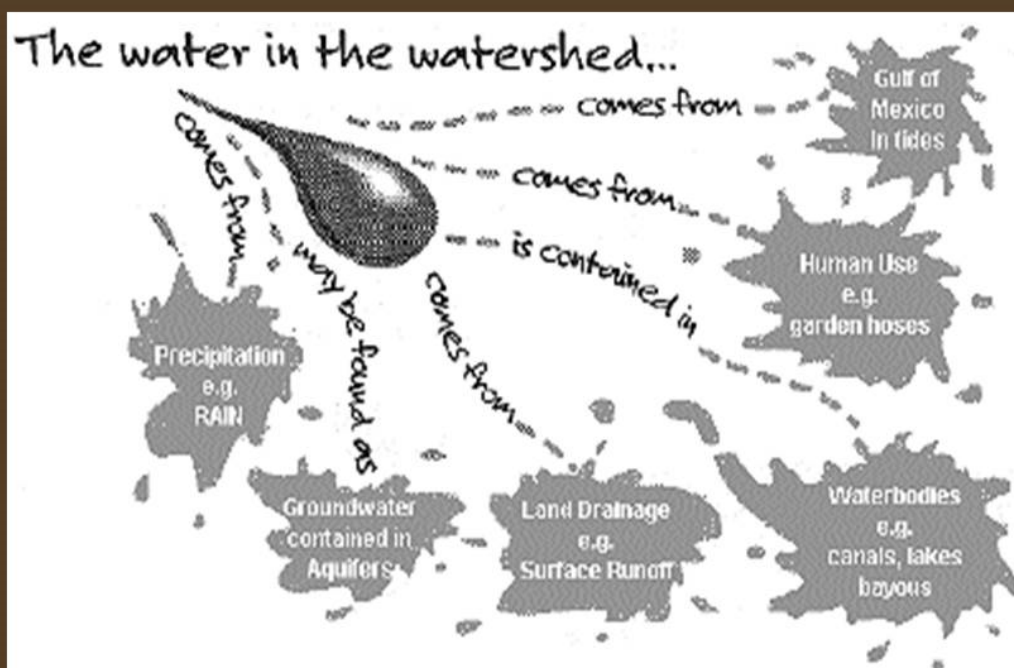
use of surface water

What is a watershed?

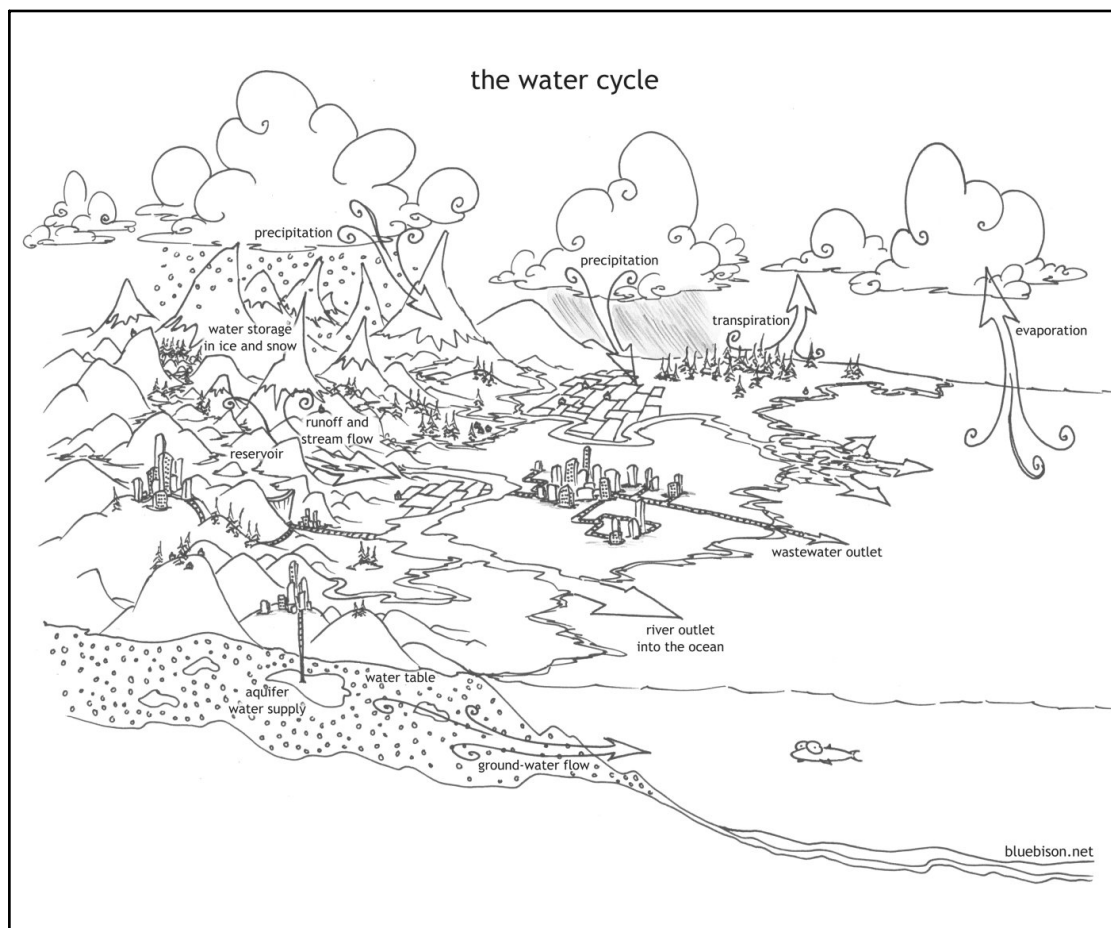


watershed

Where does the water come from?

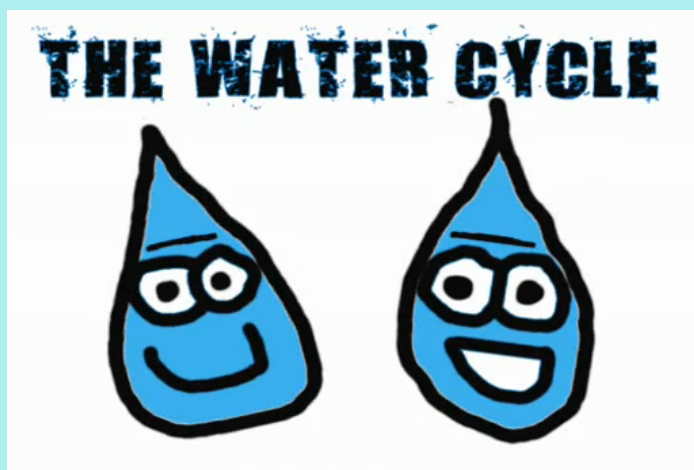


watershed 2



May 9-8:43 AM

Student Practice



http://www.epa.gov/ogwdw/kids/flash/flash_watercycle.html

Interactive activity

interactive water cycle-includes groundwater

EditCheckResetSolve?

Word	Description
source of ...	snow, sleet, hail, and rain that soaks into the ground
aquifer	an underground layer of rock that holds fresh water and allows water to move
runoff	water that flows over land
surface water	water found on the surface such as streams, rivers, lakes, oceans
watershed	the total land area that contributes runoff to a specific body of water
water cycle	movement of Earth's water in a cycle
groundwater	water that fills spaces under ground
water table	the level at which an area underground is completely full of water

vocab

EditStart

100

?

Sound ☒

label parts of a watershed

Pull

Complete the venn diagram.

ground water

surface water

9. This type of water is usually found between rocks and sediments beneath the surface of the earth.

11. This type of water is found in the ground.

10. This is where aquifers are found.

13. Wells are used to get fresh water from this source.

7. This source is part of the water cycle.

8. This source gets some of its water from precipitation.

6. Watersheds contribute to this source.

3. Water from this source is used daily by humans.

5. Some of the water from run-off soaks into the ground.

12. This type of water is found above the ground.

4. Run-off flows downward to collecting areas such as lakes and bayous.

2. It is easier for this source to be polluted by humans.

1. It includes streams, rivers, lakes, ponds, bayous, etc.

?

✓

Venn-ground vs surface

Part 2--Human Impact

Ground & Surface Water

part 2

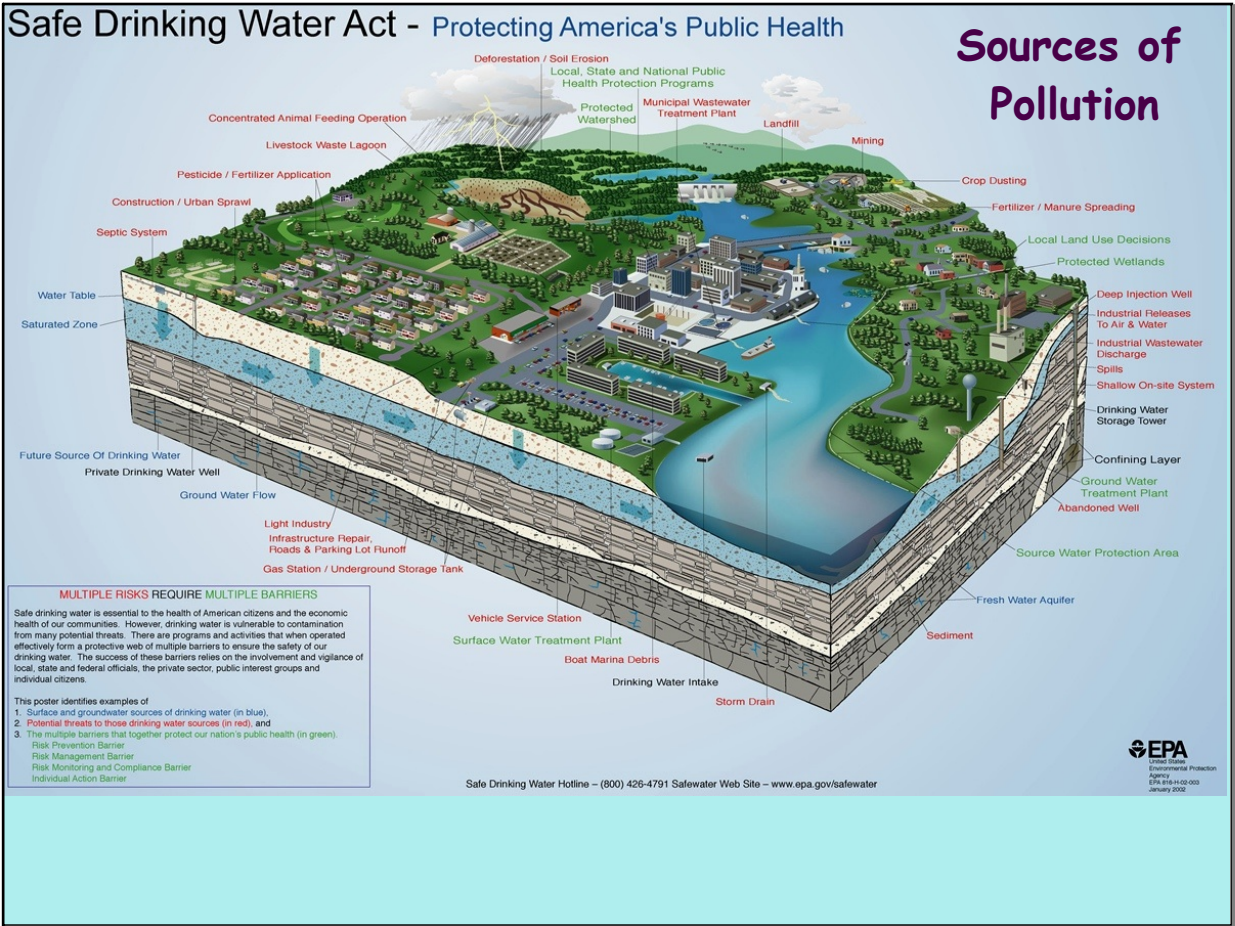


How can human activity contaminate or deplete water resources?

water pollution

Safe Drinking Water Act - Protecting America's Public Health

Sources of Pollution



MULTIPLE RISKS REQUIRE MULTIPLE BARRIERS

Safe drinking water is essential to the health of American citizens and the economic health of our communities. However, drinking water is vulnerable to contamination from many potential threats. There are programs and activities that when operated effectively form a protective web of multiple barriers to ensure the safety of our drinking water. The success of these barriers relies on the involvement and vigilance of local, state and federal officials, the private sector, public interest groups and individual citizens.

This poster identifies examples of

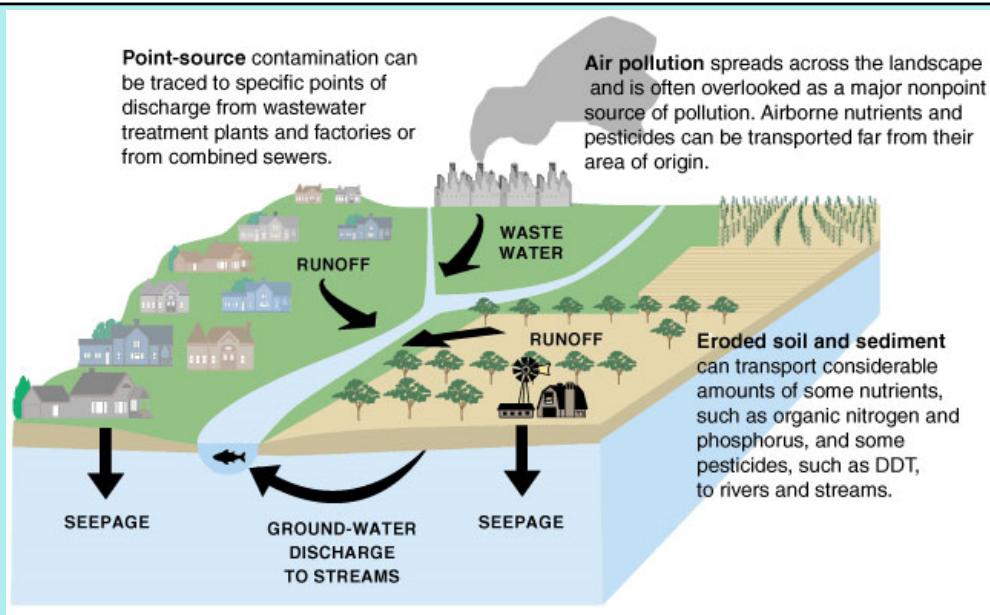
1. Surface and groundwater sources of drinking water (in blue),
2. Potential threats to those drinking water sources (in red), and
3. The multiple barriers that together protect our nation's public health (in green).

Risk Prevention Barrier
Risk Management Barrier
Risk Monitoring and Compliance Barrier
Individual Action Barrier

Safe Drinking Water Hotline – (800) 426-4791 Safewater Web Site – www.epa.gov/safewater

EPA
United States
Environmental Protection
Agency
EPA 816-H-02-003
January 2002

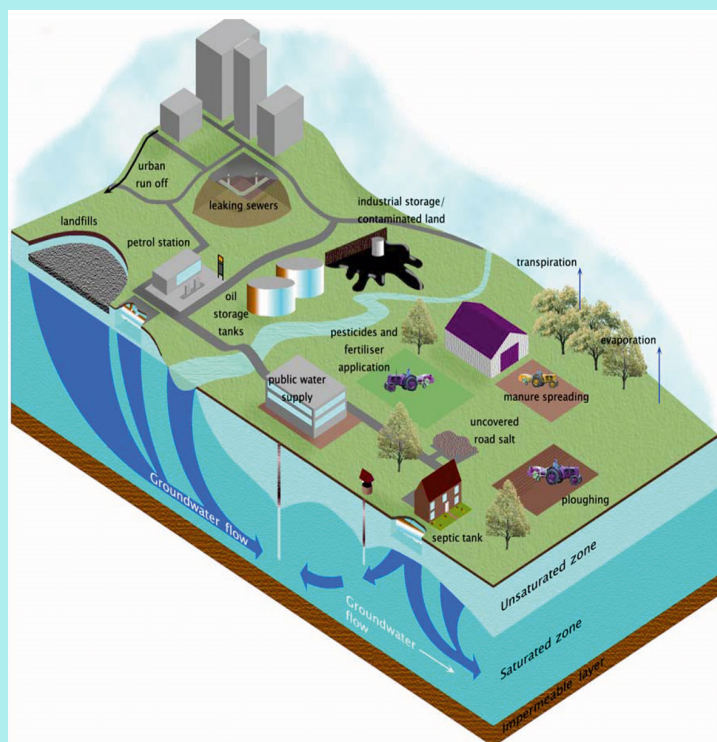
sources of pollution



With *point source pollution*, the source of chemicals or other contaminants is apparent, such as a wastewater treatment plant or a factory that releases waste directly into the water.

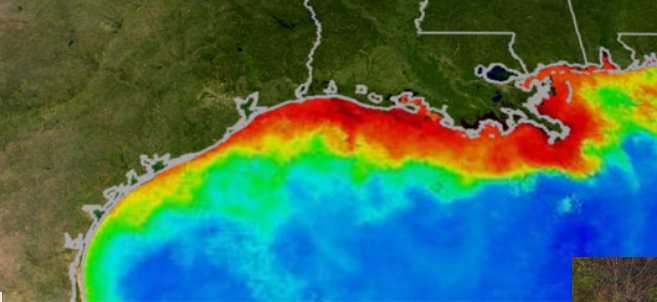
point source pollution

With *non-point source pollution*, no single source of pollution is evident, but contaminants still exist, such as fertilizer or pet waste running off from suburban yards and into storm drains.




non point source of pollution


DEAD ZONE: Fertilizer and pesticides from the Mississippi flow into the Gulf of Mexico, where they fuel algae growth that depletes the water of oxygen, killing fish and other aquatic life. (Photo: NOAA)




Fertilizer run-off



Fertilizer & Pesticide Spray





pesticides

Pesticides in water
(most were used during the study period)

	Agricultural areas	Urban areas	Undeveloped areas	Mixed land uses
Stream water	97%	97%	65%	94%
Shallow ground water	61%	55%	29%	33%

Percentage of time (streams) or samples (ground water) with one or more detections

Which type of water, ground or stream, has more pesticides in it? Why?

Which area has the largest amount of groundwater contamination from pesticides?

Why are pesticides found in the water of undeveloped land areas?

What conclusions can you draw about the use of pesticides near water resources?

How do you think the data would change if the same areas were retested 5 years from now?

pesticides 2



septic tanks



landfill

<http://oceanworld.tamu.edu/resources/environment-book/groundwatercontamination.html>

Above Ground and Underground Storage Tanks

Gasoline stations, dry cleaners, and other industrial establishments store large quantities of liquids in tanks. Some are above ground, some are below ground. Homes in cold areas store heating oil in underground tanks or in basement tanks. Underground tend to cause groundwater contamination because small leaks often go undetected.

Nearly one out of every four underground storage tanks in the United States may now be leaking, according to the U.S. Environmental Protection Agency. If an underground petroleum tank is more than 20 years old, especially if it's not protected against corrosion, the potential for leaking increases dramatically.

Even a small gasoline leak of one drop per second can result in the release of about 400 gallons of gasoline into the groundwater in one year. Even a few quarts of gasoline in the groundwater may be enough to severely pollute a farmstead's drinking water.



The EPA identified over 460,000 leaking underground storage tanks up to September 30, 2006. Steady cleanup work has progressed for over a decade and more than 350,000 contaminated sites have been cleaned up. The main concern now is contamination by methyl tertiary-butyl ether MTBE. The additive, or other additives with similar ability to oxygenate fuels, is required by the EPA to help reduce carbon monoxide emissions from cars in cold weather.

undewground storage tanks

AS A RESULT...

Safe Drinking Water Act (SDWA)

EPA and the states have the authority to ensure that drinking water supplied by public water systems meets minimum health standards.

Clean Water Act

It regulates ground water that is shown to have a connection with surface water. It sets standards for allowable pollutant discharges to surface water.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

It regulates pesticide use.

Resource Conservation and Recovery Act (RCRA)

It regulates treatment, storage, and disposal of hazardous and nonhazardous wastes.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or Superfund

It authorizes the government to clean up contamination or sources of potential contamination from hazardous waste sites or chemical spills, including those that threaten drinking water supplies.

Toxic Substances Control Act (TSCA)

It regulates manufactured chemicals.

© QT Luong / terragalleria.com

#usca9990

What is the relationship between humans and ground contamination?

Do you believe these enough to control human the contamination of ground?

Justify your answer.

Can you think of any recent current events that could have severely contaminated water sources?

nationalgeographic public_hearing

nationalgeographic.com/9-keystone-xl-groundwater/

nationalgeographic.as-water-district-on-of-the-

ogallala-aquifer/

http://news.nationalgeographic.com/news/energy/2011/11/pictures/111111-nuclear-cleanup-struggle-at-fukushima/?source_newstravel_news

laws 2

"The Story of Groundwater"



groundwater video & song

Lesson Notes

Back

Subject:	Science
Topic:	Ground & Surface Water <small>(7.8 C-human impact on ground and surface water)</small>
Grade:	Grade 7
Key Vocab:	groundwater, aquifer, runoff, surface water, watershed, percolation
Materials:	Smartboard, individual computers
Standard:	7.8C —Model the effects of human activity on groundwater and surface water in a watershed (Supporting Standard-10 days)

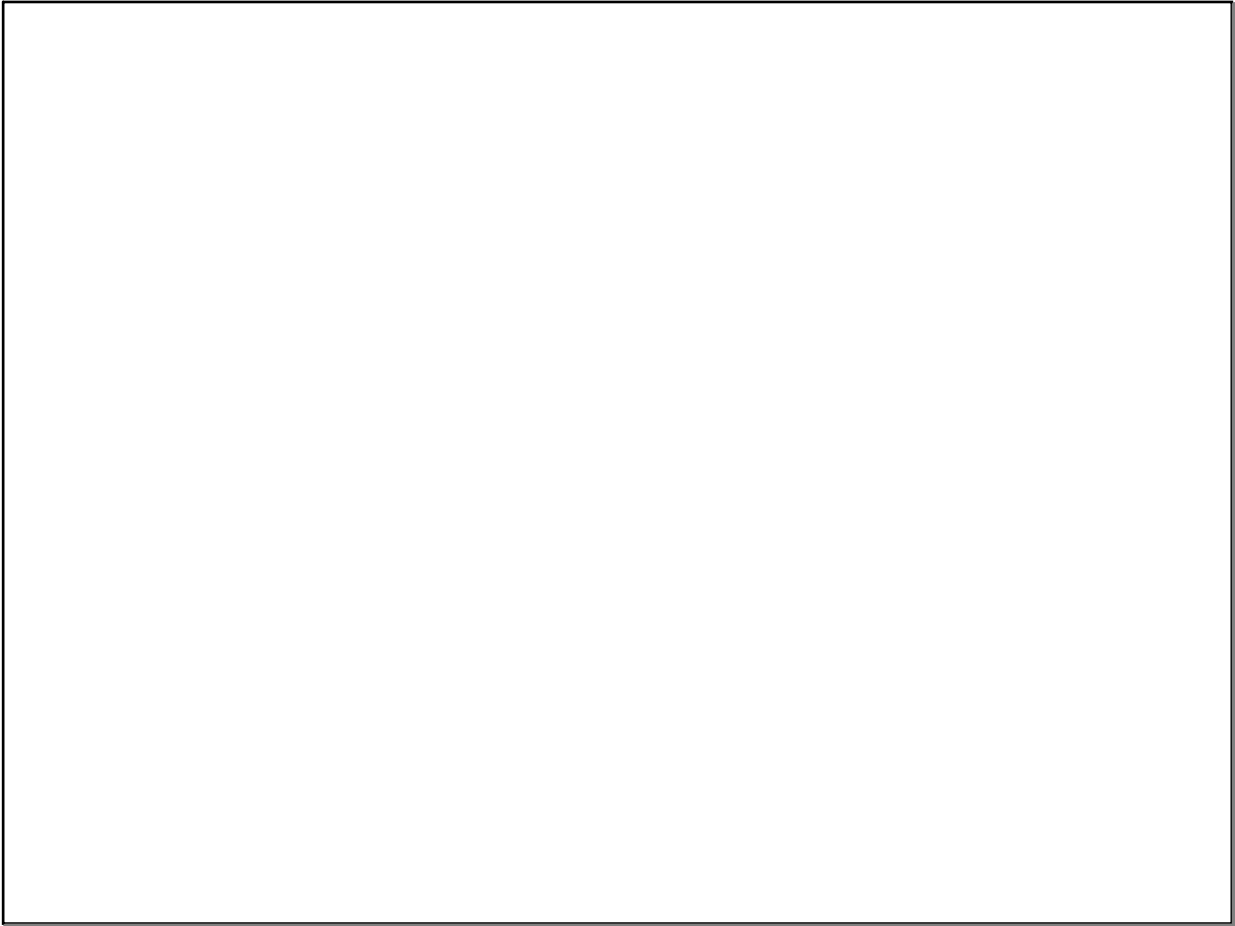
lesson info

• Resources/diagrams/pictures

<http://www.mqinfo.org/plannededuc0019.asp>
<http://ga.water.usgs.gov/edu/mearthsw.html>
http://www.conservationinformation.org/?action=learningcenter_kyw_groundsurfacewater
<http://www.groundwater.org/kc/kc.html>
<http://www.arrowsmithwater.com/water-treatment-questions/31-water-treatment-faq/118-what's-the-difference-between-ground-water-and-surface-water-is-one-safer-than-the-other->
<http://imnh.isu.edu/digitalatlas/hydr/concepts/gwater/aquifer.htm>
<http://www.dpiw.tas.gov.au/inter.nsf/ThemeNodes/RPIO-4VY3F4?open>

Ppt slides from Leslie Carter-Farley

resources



May 12-2:32 PM