Mr. Standifer

**Freshwater**

**Water Cycle**

* Water on Earth may follow a variety of pathways as it is recycled through the processes of evaporation and condensation.
* Earth’s water supply is recycled in a continuous process called the water cycle.
* Infiltration of water depends on
	+ the number of open pores or spaces in Earth materials
	+ unsaturated pores in the ground.
	+ Infiltration is?1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Percolation is?2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Transpiration is?3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Watersheds**

* All the land area that drains into a stream system is the system’s watershed, or drainage basin.
* Elevated land areas called 4.\_\_\_\_\_\_\_\_\_\_ separate one watershed from another.

**Discharge Rates**

* A stream’s load is all the material the stream carries.
	+ This includes material in

- 5.\_\_\_\_\_\_\_\_\_\_\_

- 6.\_\_\_\_\_\_\_\_\_\_\_

- 7.\_\_\_\_\_\_\_\_\_\_\_

* A stream’s carrying capacity is its ability to transport material.
* Carrying capacity depends on 8.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Discharge** is the volume of stream water that flows past a location in a given period of time.
	+ expressed in 9.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_).
* formula for calculating stream discharge:
* 10.

**Flooding**

* A floodplain is a broad, flat area that extends out from a stream’s bank.
* Formed by previous flood events
* Flooding occurs in
	+ small, localized areas as upstream floods
	+ large, downstream floods.
* Water from precipitation gathers at a stream’s source area, or 11.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The stream’s water flows in 12.\_\_\_\_\_\_\_\_\_\_\_\_\_ confined by the stream’s banks.
* 13.\_\_\_\_\_\_\_\_\_\_\_\_\_ are streams that join into a stream contributing more water and increasing the streams size.

**Deposits**

* Alluvial fans and deltas form when stream velocity decreases and sediment is deposited.
* Alluvial fans are fan shaped, and they form where water flows 14.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Deltas are triangular, and they form when 15.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Lakes and Wetlands**

* Lakes form in a variety of ways when depressions on land fill with water. Lakes may be natural or human-made.
* 16.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs in a lake when nutrients from fertilizers, detergents, or sewage are added.
* Wetlands are low-lying areas that are periodically saturated with water and support specific plant species. Wetlands include bogs, marshes, and swamps.

**Precipitation and Groundwater**

**Groundwater Storage**

* **Porosity** is the percentage of pore space in a material.
* **19.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the ability of a material to let water pass through it.

**The Zone of Saturation**

* **zone of aeration** the unsaturated portion of the soil where pores are filled with 20.\_\_\_\_\_\_\_\_\_\_\_.
* The **water table** is the 21.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* **zone of saturation** is the depth where groundwater completely fills all the pores of a material.

**Gravitational water and Capillary water.**

* Gravitational water trickles downward as a result of the force of gravity.
* Capillary water is 22.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* held in pore spaces as a result of surface tension.

**Groundwater Movement**

* **Aquifers** are permeable layers where most groundwater flow takes place.
* 23.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are impermeable layers.

**Groundwater Erosion and Deposition**

* Most groundwater contains some 24.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Acidic groundwater attacks carbonate rocks, especially limestone.

**Caves**

* A **cave** is a natural underground opening with a connection to Earth’s surface.
* caves are formed when groundwater dissolves 25.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Dissolution by Groundwater**

* **Karst topography** describes limestone regions that have sinkholes, sinks, and sinking streams.
* A **sinkhole** is caused by the collapse of a cave or by the dissolution of bedrock by acidic rain or moist soil.
* A 26.\_\_\_\_\_\_\_\_\_\_\_\_\_\_forms when a surface stream drains into a cave system, continues underground, and leaves a dry valley above.

**Hard Water**

* Water that contains high concentrations of 27.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is called hard water.
* Hard water is common in 28.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ areas where the groundwater is nearly saturated with calcium carbonate.
* Water that contains few dissolved ions is called 29.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Groundwater Deposits**

* Dripstone formations are built slowly as water drips through caves, depositing a tiny amount of calcium carbonate with each drop.
* **Stalactites** are cone-shaped or cylindrical structures that hang from a cave’s ceiling like icicles.
* **Stalagmites** are mound-shaped dripstone deposits that form as water drops splash to the floor of a cave.
* **30.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the type of limestone that composes dripstone formations.

**Springs**

* Aquifers are permeable underground layers through which groundwater moves with relative ease.
* 31.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, such as layers of clay or shale, block groundwater movement.
* **Springs**, or natural discharges of groundwater, tend to occur where an aquifer and an aquiclude come in contact with Earth’s surface.

**Emergence of Springs**

* In regions of near-horizontal sedimentary rocks, springs often emerge on the sides of valleys at about the same elevation, at the bases of aquifers.
* Springs may also emerge at the edges of perched water tables. A perched water table is a 32.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* Springs also tend to emerge along faults, which are huge fractures that offset rock formations and sometimes block aquifers.
* In limestone regions, springs discharge water from underground pathways.

**Wells**

* **Wells** are holes dug or drilled deep into the ground to reach a reservoir of groundwater.
* To produce water, a well must tap into an aquifer.
* The simplest wells are those that are dug or drilled below the water table, into the zone of saturation, and into what is called a water-table aquifer.
* Overpumping of the well lowers the water level in it and produces a 33.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_in the water table around the well.
* **34.\_\_\_\_\_\_\_\_\_\_\_\_\_**is the difference between the original water-table level and the water level in the pumped well.
* **Recharge** is the process in which water from precipitation and runoff is added back to the zone of saturation.
	+ **Lateral recharge 35.**
	+ **Natural recharge 36.**

**Confined Aquifers**

* Water-table aquifers are 37.\_\_\_\_\_\_\_\_\_\_\_\_and unprotected, and thus, they are 38.\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* More reliable and less easily polluted water supplies can be found in deeper aquifers, called confined aquifers, which are generally 39.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The aquicludes form barriers that prevent pollutants from reaching such aquifers.

**Artesian Wells**

* Because the area of recharge is usually at a higher elevation than the rest of an aquifer, a confined aquifer contains water under pressure.
* The aquifer is called an artesian aquifer.
* An **artesian well** is a well drilled into a confined aquifer from which water spurts above the land surface in the form of a fountain.
* An artesian spring is a spring that discharges pressurized water.
* An important artesian aquifer in the United States is the 40.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, which is located in the Great Plains.

**Threats to Our Water Supply**

* Freshwater is Earth’s most precious natural resource.
* Human demands for freshwater include household use, agriculture, and industry.
* What percent of what is freshwater?41. \_\_\_\_\_\_\_\_\_\_\_\_\_
* What percent is surface water? 42\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Overuse**

* If groundwater is pumped out at a rate greater than the recharge rate, the groundwater supply will inevitably decrease, and the water table will drop.
* This is happening to the Ogallala Aquifer as water is withdrawn, mostly for 43.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Subsidence**

* Ground subsidence, or the 44.\_\_\_\_\_\_\_\_\_\_\_\_\_\_, is a problem caused by the excessive withdrawal of groundwater.
* Water pressure helps carry the weight of the material overlying an aquifer.
* If that pressure is reduced, the weight of the overlying material is transferred to the aquifer’s mineral grains which then compresses.

**Pollution in Groundwater**

* Water-table unconfined aquifers are the most easily polluted groundwater reservoirs.
* Confined aquifers, though somewhat protected from local pollution, become contaminated when their recharge areas are polluted.
* The most common sources of groundwater pollution are 45.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Chemicals dissolved or transported with groundwater are in the form of ions and molecules, and thus, 46\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Chemicals generally move downslope from a source in the form of a 47.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a mass of contaminants that spreads through the environment.
* Once chemical contaminants have entered groundwater, they cannot be easily removed.

**Salt**

* In many coastal areas, the contamination of freshwater by salt water is the major problem.
* In such areas, the fresh groundwater near Earth’s surface is underlain by denser, salty seawater.
* The overpumping of wells can cause the underlying salt water to rise into the wells and contaminate the freshwater aquifer.
* This activity is called a 48.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Radon**

* A source of natural pollution is radioactive radon gas, which is one of the leading causes of cancer in the United States.
* This form of radon is generated by the radioactive decay of uranium in rocks and sediments, and it usually occurs in very low concentrations in all groundwater.
* Radon may seep into houses, and, because it is heavier than air, it can accumulate in poorly
ventilated basements.

**Protecting Our Water Supply**

* There are a number of ways in which groundwater resources can be protected and restored.
* All major pollution sources need to be identified and eliminated. Pollution plumes that are already in the ground can be monitored through observation wells and other techniques.
* Pollution plumes may be stopped by the building of 49\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Polluted groundwater can be 50.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.