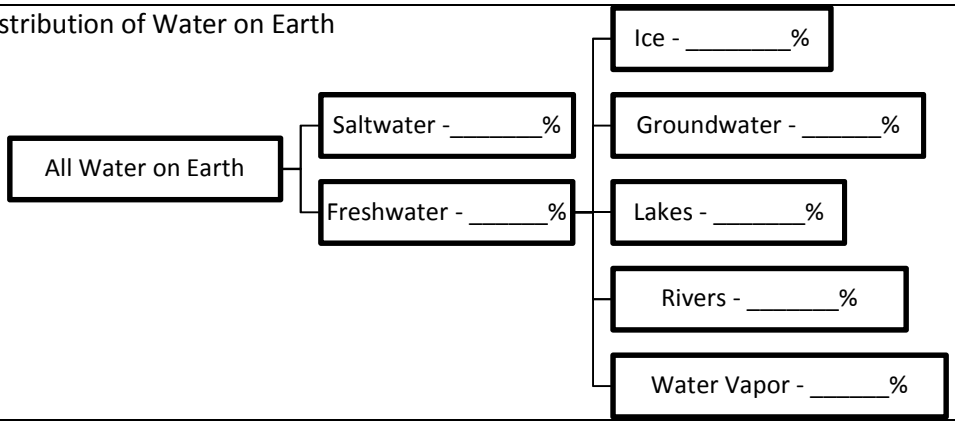
Unit 5 Freshwater Notes Name: _____

Water Uses and the Water Cycle
Date:
SWABT: Draw and describe the water cycle. ID and describe sources of freshwater and how to conserve the resource.

All living things need water
Human uses include:

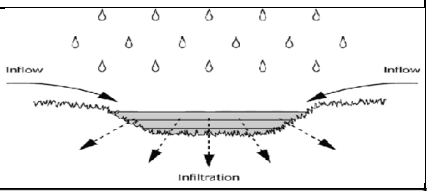
-
-
-
-
- Hydroelectric Energy

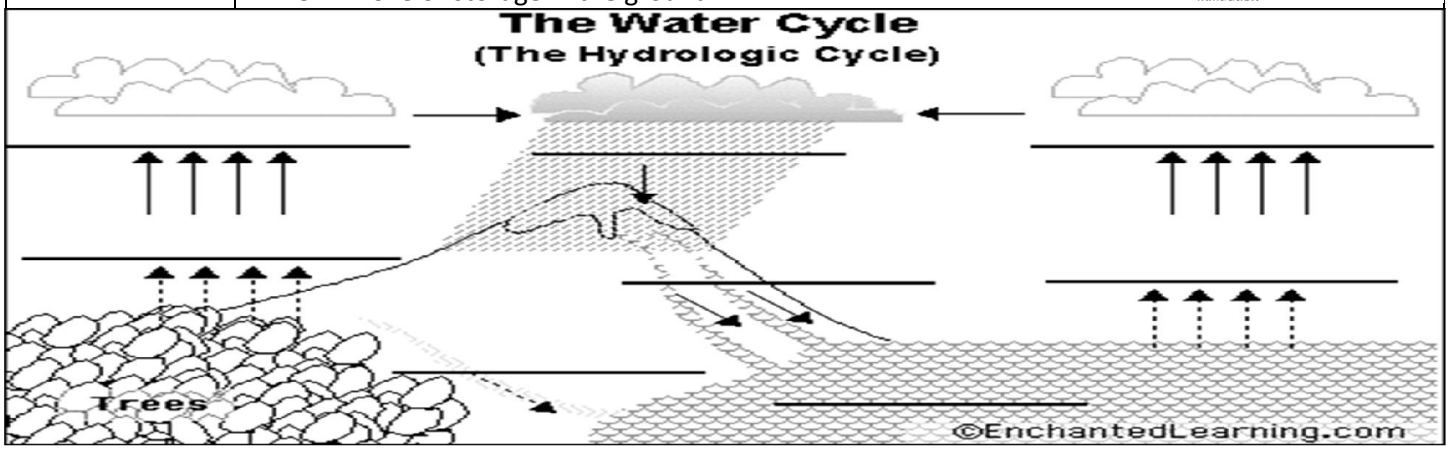
Distribution of Water on Earth



Water moves on Earth through the continuous process of the **water cycle.**
Water Cycle –

The Water Cycle	Description
Evaporation (liquid → gas)	
Transpiration (liquid → gas)	
Condensation (gas → liquid)	
Precipitation	• **A decrease in precipitation decreases the amount of infiltration of water into the ground**
Infiltration	• Infiltration recharges groundwater supplies
Groundwater	• Vast amounts of water are unseen underground. • This water can move through the water cycle several ways: 1. Transpiration by plants 2. Move into surface water like streams 3. Move or storage in the ground

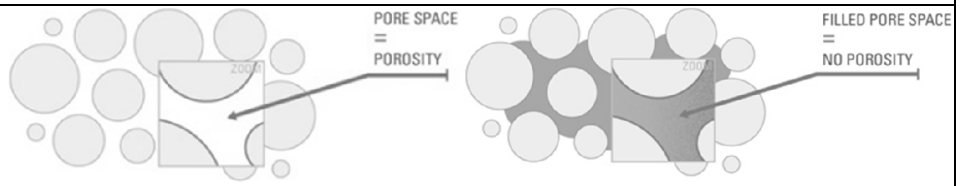
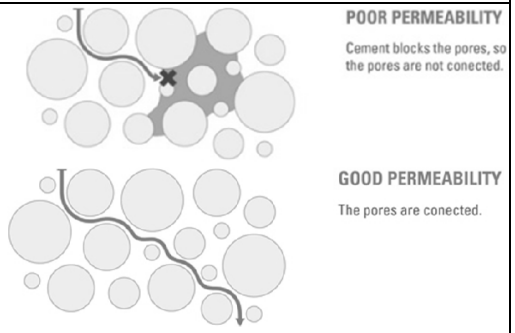


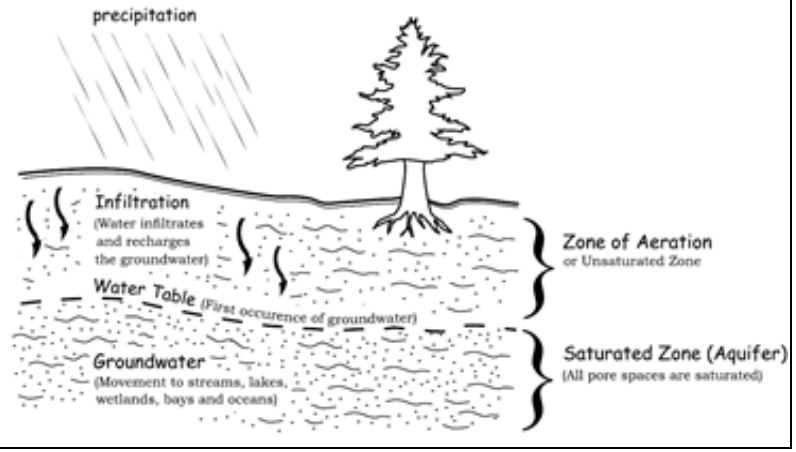


Unit 5 Freshwater Notes Name: _____

Groundwater, Wells, and Springs
Date:
SWBAT: Draw and describe the layers of groundwater & discuss how water infiltrates the soil. ID sources of groundwater pollution.

Aspects of Groundwater

Term	Description
Groundwater	Water under the lands surface often stored in _____
Aquifer	_____ layers or sediments that transmit groundwater freely. • Important source of well water
Porosity	Percentage of the total volume of rock or sediment that consists of _____ • Sorting: Rocks can be sorted into porous or non-porous 
Permeability	A materials ability to _____ interconnected pore spaces • Groundwater moves more slowly when the pore spaces are smaller • Ex: **Fine clay** is _____ because its pore spaces are so small water can't move through them 
Zone of Aeration	The region between _____ • **A _____ during periods of heavy rainfall or rapid snow melt can lead to flooding** • **Since the ground is already saturated (full of water), no more water can infiltrate into the ground which leads to flooding!**
Water Table	the level below which the ground is saturated with water
Zone of Saturation	Area where water _____ in sediment and rock • **Groundwater is within this zone**



Groundwater and Surface Water Interaction

Term	Description
Ordinary Well	A hole that is dug below the water table and fills with groundwater. • Pumping is _____ • **Several wells drilled in a given area will: _____**
Artesian Well	**Groundwater rises on its own _____ out of well.** • The pressure is due to the water being sandwiched between two impermeable rock layers • No pumping is necessary!
Subsidence	_____ in response to *geologic* or man-induced causes. • **Caused by pumping water out of the ground.** 
Why is subsidence an issue for North Carolina?	
Springs	A section of impermeable rock forces groundwater to _____ _____ and emerge onto the surface of the Earth
Hot Springs	Temperatures increase into the earth. • Water from hot springs just originate_____ earth or is heated by magma.
Geyser	Hot springs that _____ • Small opening in crust…pressure builds until an eruption occurs • Ex: Old Faithful in Yellowstone National Park

Groundwater Pollution: Ground water is renewable; yet limited

- Ways groundwater can be polluted:
  - _____
  - Pesticides
  - _____
  - _____
  - Arsenic (naturally occurring, factories, mining, and preserving bodies)

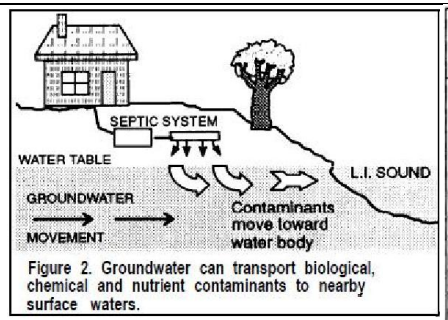
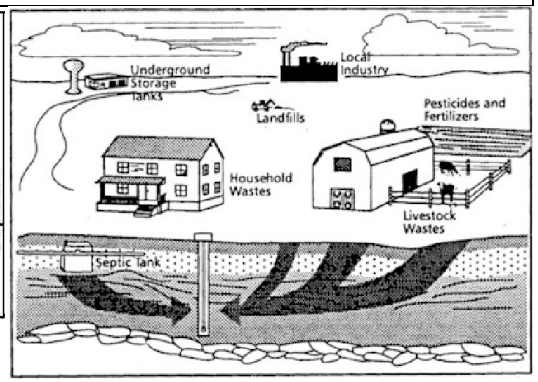


Figure 2. Groundwater can transport biological, chemical and nutrient contaminants to nearby surface waters.



Unit 5 Freshwater Notes Name: _____

Populations Effects on Water Resources
Dates:
SWBAT: Understand where point/non-point source pollution originates.

Water pollution is the addition of _____.

- Sources of water pollution in the US include:
  - _____
  - run-off from fields treated with _____
  - run-off from areas that have been mined

Types of Water Pollution

Point Source Pollution

Definition: contamination that enters the environment through a _____ means

Examples:

- Sewage plant pipe
- **Coal ash ponds**

Non-Point Source Pollution

Definition:

- Results from land runoff, precipitation, atmospheric deposition, drainage or seepage.

Examples:

- _____
- Arsenic from mining
- Sediment from land runoff

How to Reduce Point and Non Point Pollution

- Use fertilizer and pesticide according to package directions
- Have septic systems _____
- Conserve sprinkler water
- Never dump anything down a _____
- Pick up after your pets. Pet waste left on the ground can spread E. coli, roundworms and Salmonella.

Pollutants move through a water supply _____

- As water moves towards the ocean, pollutants build up and can become _____

Population Effects on Water <u>Quantity</u>

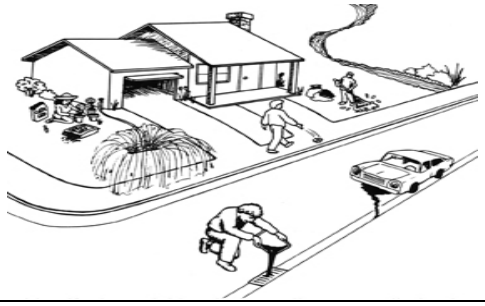
- Communities across the country are starting to face challenges in maintaining healthy and affordable water supplies
- **An increase in population size means there is _____**

Methods of Conservation:

- _____
- Turning off the faucet
- _____
- Water rations
- Watering plants at night or early morning

Population Effects on Water <u>Quality</u>

- As populations grow rapidly, health standards find it difficult to keep up.
- **This leads to an increase in _____ _____as pollutants build up.**



Water Treatment

Wastewater Treatment Systems

- The major aim of wastewater treatment is to remove _____ before the remaining water is discharged back to the environment.
- **Treatment facilities are unable to filter out all contaminants.**

Drinking Water Treatment System

1. Remove small and large sediments from water
2. Water forced through filters to remove _____
3. Removal of _____

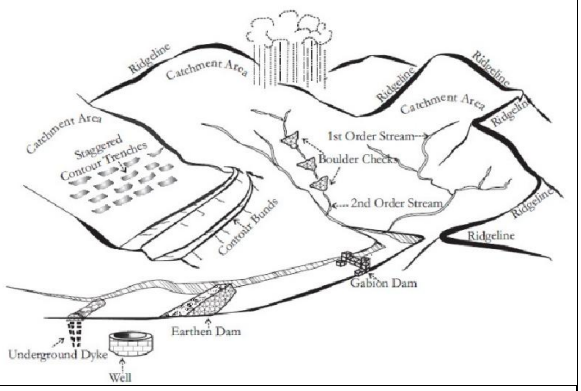
Unit 5 Freshwater Notes Name: _____

River Health
Date:
SWBAT: Identify indicators of freshwater quality.

Indicators of Water Quality		
Term	Description:	Changes Caused By:
Turbidity	Definition: The measure of the degree to which water _____ due to the presence of suspended sediment. • **The Mississippi River is an example of a high turbidity body of water**	• _____ • Re-suspended sediments from the bottom • Waste discharge • _____ • Urban runoff
pH	Definition: • 0→7 is _____ • 7→14 is _____ • Surface freshwater is usually 6.5-8 Changing pH in a stream can be an indicator of increasing pollution	• Natural conditions • Dumping of _____ • _____ Results of changes in pH: Most aquatic life cannot withstand water outside of the usual pH range, thus resulting in death
Dissolved Oxygen	Definition: When D.O. drops too low, fish die. When DO is high, the water tastes better but can damage water pipes.	• Rapidly moving water (_____) • Increased temperature (_____) • Discharge from sewer pipes (_____) ○ Causes an increase in bacteria
Temperature	Definition: • Extreme low or high temperatures are only tolerated by hardy fish! **Factory thermal pollution by dumping heated water into lakes and rivers – decreases species in body of water**	• _____ • Depth of water • Shade from shoreline
Nitrates	Definition: Algae and other plants use nitrates as a source of food. If algae have an unlimited source of nitrates, an algae bloom begins to grow. • **This algae bloom _____ dissolved oxygen in water leading to aquatic insects and fish death**	**Improper use of _____ can lead to algae blooms**
Bio-Indicators	Definition: species that are used to monitor the health of an environment or ecosystem.	Example: Amphibians

Unit 5 Freshwater Notes Name: _____

River Basics and Stream Erosion and Deposition
Date:
SWBAT: Describe the parts of a river and investigate NC's river basins. ID causes and effects of stream erosion.

Parts of a River	
Term	Description
Headwaters	Definition: • Usually found in the _____ • Runoff from mountains flow into valleys, valleys become saturated • Flows to lowest point
Tributaries	Definition: • More found in mountains than on flat land
Mouth	Definition:
Watershed/ River Basin	**Definition:** 
Divide	**Definition:** 
Channel	Definition:
Gradient	Definition: • Usually expressed as the vertical drop of a stream over a certain distance (change in elevation)
Discharge	Definition: • Usually measured in cubic meters per second
Stream Load	Definition: • Erosion removes mineral material from the stream banks adding this material to the regular flow of water. • **Higher stream velocity equals higher stream load capacity—streams that move fast erode more and carry more sediment.**

Stream Erosion and Deposition

Sediment Deposition

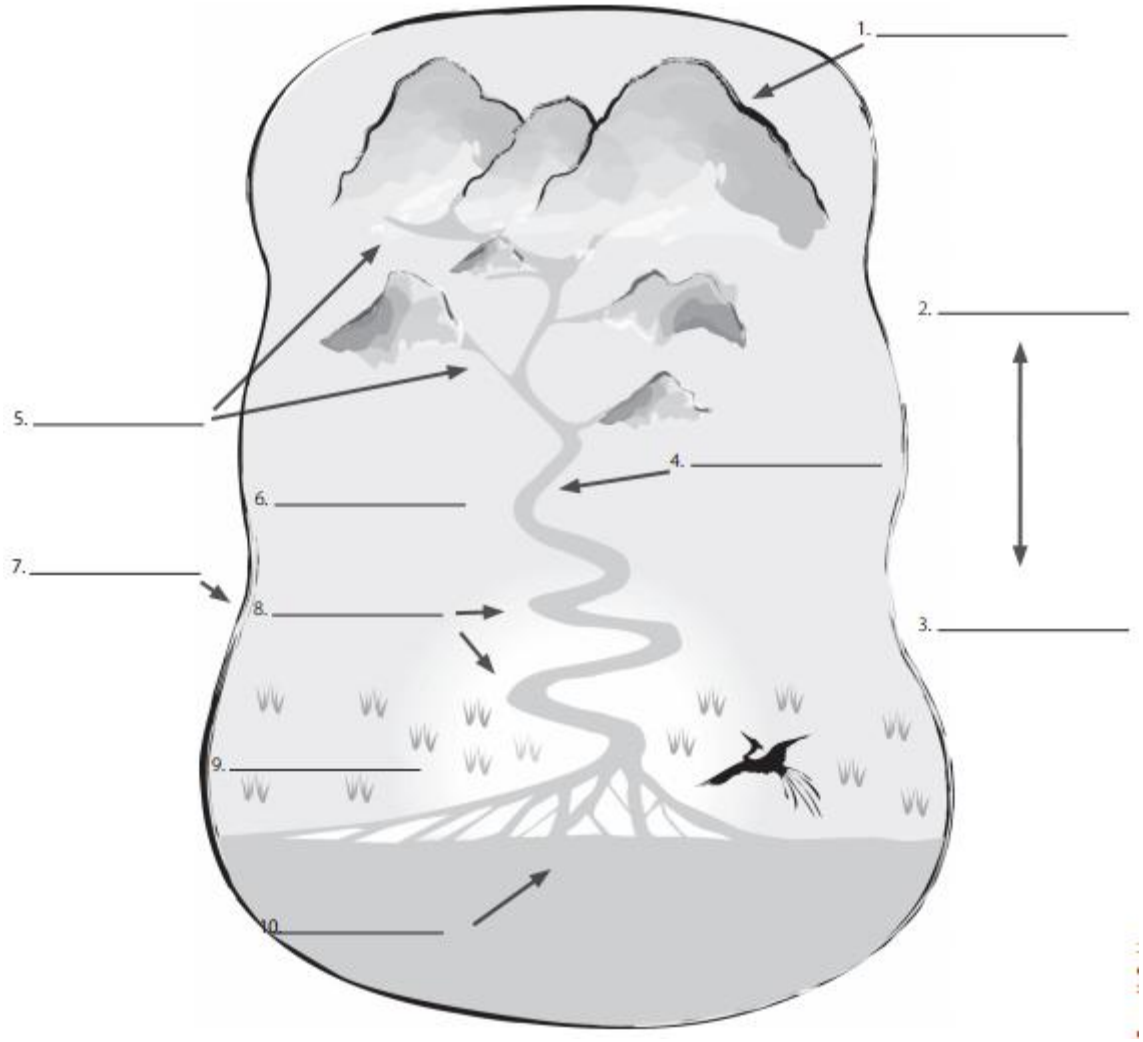
- Sediment is deposited in a stream when there is a _____ in the speed of the water.
- Speed may decrease because of:
  1.
  2. Bed widening
  3.
- Stream deposition can create landforms or change the river valley

Term	Description
Alluvial Fan	Definition: • Occurs where a stream descending a steep slope reaches flat land.
Levees	• _____ - raised river banks caused by flooding. • _____ - an embankment built to prevent the overflow of a river.
Floodplain	Definition: • **A floodplain forms where a stream cuts mainly side to side** Sediment is deposited making _____ Flooding Precautions **1. _____** 2. Flood insurance if you own a home in a high-risk area 3. Be prepared to evacuate if need be 4. _____ Why limit floodplain development? • Allows floodplains to _____ • Prevents structures from being put in harm's way
Meander	Definition: • Erosion occurs on _____ of a bend • Deposition occurs on the _____ of a bend.
Oxbow Lake	Definition:
Stages in the Development of a River	Young River: _____ shaped channel; _____ sides Mature River: _____ shaped channel; _____ sides; Features: Old River: _____ shaped channel; _____ sides; Features:
Delta	Definition: • Occurs because the water slows down as it is emptied into another body of water.
Dam	Definition: Advantages: • _____ • Hydroelectric power • Recreational facilities • Irrigation Disadvantages: • Increase accumulation of sediment in water • _____ • Destruction of natural habitat for plants and animal

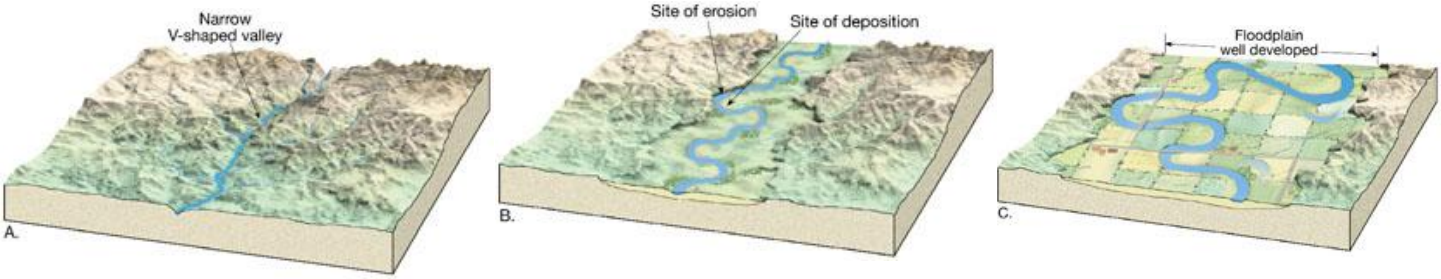
Unit 5 Freshwater Notes Name: _____

Label the components of a watershed on the diagram using the words listed below

Word Bank
Tributaries
Head of the River
Mouth of the River
Upstream
Wetlands
Watershed Boundary
Main River
Floodplain
Downstream
Meanders



Use the three rivers below to answer the following questions:



River A **River B** **River C**

1. _____ Highest Gradient
2. _____ Has the most whitewater rapids and waterfalls
3. _____ Has the lowest gradient
4. _____ Youngest (earliest) stage
5. _____ Widest floodplain
6. _____ Least likely to flood
7. _____ Has the most depositional features

Wetlands and Estuaries
Date:
SWBAT: Identify factors of wetland degradation and discuss impacts of saltwater intrusion

Wetlands – Areas of land that are covered by water at least part of the year.
Roles of Wetlands in the Ecosystem

- **Wetlands prevent flooding by _____**
- **Natural water quality improvement.**
- _____
- Fish and wildlife habitat
- Natural products for economy (etc. shellfish, timber, blueberries, medicines)

Wetland Loss	Wetland Degradation
Definition: • The United States alone has lost more than half of its original wetlands	Definition: Some human activities that degrade wetlands are: • Urbanization • • • Marinas •

Types of Wetlands

_____ - An ecosystem in which fresh water from rivers mixes with salt water from the ocean.

- Becomes a nutrient trap: mineral-rich mud drops to the bottom.

_____ – Freshwater wetland that contains non-woody plants.

- Attract many types of nesting birds.

_____ – Freshwater wetland that contains woody plants and shrubs.

Water Ecosystems

- Freshwater: lakes, rivers and wetlands (swamps and marshes)
- Mix of fresh and saltwater: estuary

Saltwater Intrusion

Definition:

How does it occur?

- Saltwater has a higher mineral content than freshwater so it is denser and has a higher _____
- Saltwater can push inland beneath the freshwater.

Causes

Human activities have increased saltwater intrusion in many coastal areas by:

- **An increase in _____ of freshwater along a coastal area**
- Digging navigation channels
- Digging drainage canals

Saltwater intrusion can be worsened by extreme events like _____ surges and sea level rise

Why is saltwater intrusion an issue for North Carolina?

- It can lead to contamination of _____

How to prevent saltwater intrusion?

- The use of injection wells, subsurface barriers, and _____ would improve water quality and prevent saltwater intrusion.