NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Envirothon Unit 1A-Abiotic Influences of Water-Mrs. Weimer

Water statistics

* Covers 75% of Earth’s surface
	+ \_\_\_\_\_\_\_ oceans
	+ \_\_\_\_\_\_\_ freshwater
		- 2% (of Total) in ice caps and glaciers
		- 1% in lakes, underground, or in atmosphere (usable by humans)
* Makes up 70% of the human body
	+ 92% of blood plasma
	+ 80% of muscle tissues
	+ 60% of red blood cells
* Physical properties
	+ Is clear, colorless, odorless, and tasteless
	+ \* Colors, tastes and odors are caused by substances dissolved in the water.
	+ Boils at \_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Freezes at \_\_\_\_\_\_\_\_\_\_
	+ Density = \_\_\_\_\_g/mL (at 4°C)
	+ Water is a \_\_\_\_\_\_\_ Molecule
* Draw the structure of the water molecule and label it:
* Forms this kind of bond\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* POLAR MOLECULE
	+ A molecule that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ areas.
	+ Also called a polar substance or polar compound.
* NON-POLAR SUBSTANCES
	+ Non-polar substances do not have charged ends
* Draw water as a polar molecule:
* POLAR MOLECULE
	+ THE PROPERTIES OF:
		- Cohesion, adhesion, specific heat, universal solvent, capillary action, surface tension
		- ALL HAPPEN BECAUSE WATER IS A POLAR SUBSTANCE!
	+ CAPILLARY ACTION
		- The combined force of attraction among water molecules and with the molecules of the surrounding material.
		- Cohesion + Adhesion
			* Capillary Action (draw it)
	+ SURFACE TENSION
		- The tightness across the surface of water that is caused by the polar molecules pulling on one another.
		- Makes the surface act like a solid
		- Surface Tension (draw it)
	+ UNIVERSAL SOLVENT
		- This is a nickname given to water.
		- Water dissolves LOTS of things.
		- Remember:
			* \_\_\_\_\_\_\_\_\_\_\_ = the thing doing the dissolving
			* \_\_\_\_\_\_\_\_\_\_\_ = the thing that dissolves away
			* Other polar molecules can be dissolved by water.
	+ NON-POLAR SUBSTANCES
		- Non-polar substances \_\_\_\_\_\_\_\_\_\_\_ dissolve in water.
		- Can you think of some examples of non-polar substances?
	+ Universal Solvent
		- Why is water so good at dissolving things?
			* Because water is a polar molecule and is shaped like a \_\_\_\_\_\_\_\_\_, it is able to break up substances into smaller pieces (dissolve).
	+ COHESION
		- Because water is a polar molecule, it is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
		- **Cohesion** – is the attractive force between water molecules.
		- Draw Cohesion
	+ ADHESION
		- Because water is a polar molecule, it is attracted to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- **Adhesion** – occurs when molecules of water are attracted to other substances.
		- Draw Cohesion
	+ SPECIFIC HEAT
		- Specific Heat = the amount of energy needed to increase the temperature of something 1 degree C.
		- Water has a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ specific heat
		- That means it takes a lot of \_\_\_\_\_\_\_\_\_\_\_\_\_\_ for water to increase its temperature.
		- This is because of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between water molecules.
		- It’s POLAR!
	+ Freezing
		- Density of ice (at 0°C) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, so ice floats in water.
		- Most liquids become more dense as you cool them. However, when water freezes, a large expansion occurs.

Pennsylvania Watershed (Unit 1 Part 2)

* A watershed is the land area from which \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ drains into a stream, lake, reservoir or other body of water.
* A basin is the large land area that is made up of many \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_that are drained by a river system.
* Pennsylvania Watersheds:

SODPEG S= Susquehanna O= Ohio D= Delaware P= Potomac E= Lake Erie G= Genesee





* Watersheds are surrounded by topographic highs called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Within all watersheds, small streams
	+ (1) join together to form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ (2) and larger streams join together to form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ (3). Rivers eventually empty into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ (4) where the water may stay for some time or evaporate and form precipitation. Some of this precipitation falls on the land and the process repeats itself endlessly**.**
* Draw how water moves through one of our watersheds:
* Pennsylvania has more miles of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than any other state, excluding Alaska!
* If you floated a boat down the Youghiogheny River it could end up in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!
* All the stream water in PA eventually ends up in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Forest watersheds supply over \_\_\_\_\_\_\_\_\_of our drinking water!
* If you floated a toy boat down the Laurel Hill it could end up in the Gulf of Mexico
* If you went to an area on the other side of the continental divide (on the way to Frostburg) a toy would float to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Pennsylvania State Water Plan organizes the state’s freshwater systems into \_\_\_\_\_\_\_\_\_\_watersheds
* Characteristics
	+ All contain water
	+ Have a divide
	+ Contain land
	+ Drains to a body of water
	+ Water eventually drains to an ocean

* ABIOTIC FACTORS
	+ DISSOLVED OXYGEN
		- * Organisms that live in water require oxygen to survive, just like land organisms do.
			* The amount of dissolved oxygen in water determines what kind of fish and other organisms live in the water.
			* In estuaries like the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the amount of dissolved oxygen in the water varies with the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
			* Must be greater than \_\_\_\_\_\_\_\_\_\_\_ mg/1 for fish and aquatic organisms to survive
	+ WATER TEMPERATURE
		- The temperature of water can change greatly in a watershed over thecourse of a year depending on the seasons.
		- Water temperature affects the types of organisms that can live and reproduce in areas of the watershed.
		- For example, fish that need cooler water temperatures may \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to cooler waters in summer months.
		- Toleerance levels range from \_\_\_\_\_\_\_\_\_\_\_\_ degrees
	+ pH
		- pH is a measurement of the acidity or alkalinity (base) of a solution.
		- When substances dissolve in water they produce charged molecules called \_\_\_\_\_\_\_\_\_\_\_\_
		- Acidic water contains extra hydrogen ions (H+) and basic water contains extra hydroxyl (OH-) ions.
		- pH is measured on a scale of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- Neutral water has a pH of \_\_\_\_.
		- Acidic water has pH values less than 7, with 0 being the most acidic.
		- Likewise, basic water has values greater than 7, with 14 being the most basic.
	+ Acid Rain
		- Acid rain is anything below 7 on the pH scale
		- Three ways it can harm fish
			* Eggs
			* Gills
			* Body Chemistry
		- AVERAGE pH rainfall in PA is \_\_\_\_\_\_\_\_\_\_
		- Some of the most acid in the country
		- Most aquatic animals and plants have adapted to life in water with a specific pH and may suffer from even a slight change.
		- Even moderately acidic water (low pH) may reduce the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of fish eggs, irritate fish and aquatic insect \_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
		- Water with extremely high or low pH is deadly.
		- A pH below 4 or above 10 will kill most fish and very few animals can tolerate waters with a pH below \_\_\_or above \_\_\_.
		- Amphibians are particularly vulnerable to low pH, likely because their skin is so sensitive to pollutants.
		- Some scientists believe the recent drop in amphibian numbers around the world is due to low pH levels caused by acid rain.
		- Aquatic invertebrates
			* Have external skeletons
			* Shells made from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
			* Extra sensitive to pH change
		- Acid Rain
			* Derived from
			* Power stations, factories and cars all burn fuels and therefore they all produce polluting gases.
			* Some of these gases (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) react with the tiny droplets of water in clouds to form sulphuric and nitric acids.
			* The rain from these clouds then falls as very weak acid - which is why it is known as "acid rain".
		- Clean Air Act
			* 1990
			* Congress passed an ammendment to reduce \_\_\_\_\_\_\_\_\_\_\_\_\_\_ emissions
	+ Water Pollution
		- 1/5 of PA streams and ½ of PA lakes are impaired or polluted
		- Come from 2 sources
			* Agriculture runoff
			* Abandoned mine drainage
		- Agriculture runoff
			* When runoff from rain or snow carries soil, pesticides and fertilizers from fields to water
			* Soil=can be suspended in the river
				+ Makes \_\_\_\_\_\_\_\_
				+ Can damage \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
				+ Can absorb more sunlight and make temps \_\_\_\_\_\_\_\_\_\_\_
				+ Silt that settles into sediment make it difficult for fish to find food on the bottom
				+ Can kill invertebrates by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
			* Fertilizer on the field makes plants grow and does the same for aquatic plants
				+ Make aquatic plants a nuisance
				+ Decomposing plants comsume \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
				+ This leads to :

Brook trout, mayflies, caddisfly and stone flies=die

Small mouth bass, rock bass, and catfish=more tolerant and will stay

* + - Abandoned Mine Drainage
			* Pollutes almost 1/2 of PA waters
			* Lowers the \_\_\_
			* Below \_\_\_algae and plants die
			* can make the stream waters and bottom appear yellow (\_\_\_\_\_\_\_), white (\_\_\_\_\_\_\_\_\_\_\_\_\_\_), and black (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)