Quality of Streams

February 10, 2015

Measurement Tools of Water Quality

- **Temperature**
- **pH Scale**
- **Amount of Oxygen**
- **Amount of Nitrates and Phosphates**
- **Turbidity**
- **Invertebrates**

Thermal Pollution

- **Defined:**
- When an activity causes the temperature of the water to change. Results in shock to aquatic life.

- **Several Examples, Pick One!**

-Change from lower to higher temperatures when water is used to cool power plants

-Change from higher to lower temperatures when cooler water at the base of a dam is released

-Cutting down trees along rivers and streams reduces shade and the water warms

-Soil erosion particles in the stream due to erosion absorb sunlight increasing water temperatures

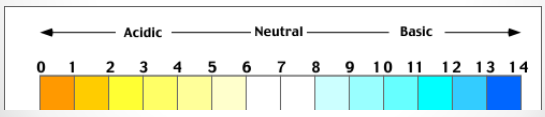
pH Scale

- **Definition:**
- Helps determine the health of water. Ranges from 0-14. pH < 7 is acidic, pH > 7 is basic, pH = 7 is neutral

- **Application:**
- Most natural lakes and rivers in the US have a pH of 6.5-8.5.

Acid Test Mini Lab

- Different organisms can live at different pH ranges, but all fish die if the pH is below 4 or above 12.
- Using the pH paper, find the pH of the two solutions on your desk.
- As a class we'll combine our results together!



Acid Test Results

Liquid	pH Value	Acidic, Neutral or Basic?
Orange Juice		
Coffee Creamer		
Glass Cleaner		
Water (Tap)		
Lemon Juice		
Soap		
Soda		
Washing Detergent		
Coffee		
Rain		

Acid Test Results

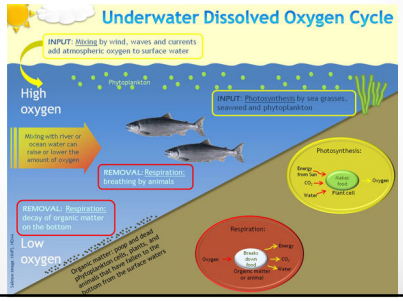
Homework

Liquid	pH Value	Acidic, Neutral or Basic?
Orange Juice	3	Acidic
Coffee Creamer	7	Neutral
Glass Cleaner	11	Basic
Water (Tap)	5.5	Acidic
Lemon Juice	1	Acidic
Soap	5	Acidic
Soda	4	Acidic
Washing Detergent	8	Basic
Coffee	5	Acidic
Rain	5	Acidic

Oxygen (In Water)

Homework

- **Definition**
- Known as dissolved oxygen. Organisms that live in the water need oxygen to live, just like organisms that live on land.



Oxygen (In Water)

Homework

- **Application**

	Low Levels of Oxygen	High Level of Oxygen
Warm Water	✓	
Cold Water		✓
Fast-Flowing Water		✓
Slow-Flowing Water	✓	
Large Amount of Bacteria	✓	
Algae during the day		✓
Algae during the night	✓	

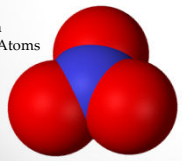
- During the day plants and algae produce oxygen in the water through **photosynthesis** and oxygen levels can increase.
- But at night plants and algae use oxygen through **respiration** (opposite of photosynthesis) and cause dissolved oxygen levels to decrease.

Nitrates & Phosphates

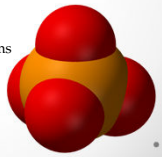
Homework

- **Definition**
- Form of nitrogen/phosphorus, needed for plant growth. Too much makes water unhealthy.
- **Application**
- Found in fertilizers, animal waste and sewage

Nitrate
1 Nitrogen
3 Oxygen Atoms



Phosphate
1 Phosphorus
4 Oxygen Atoms

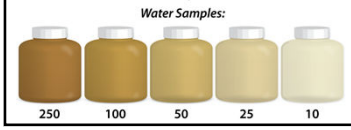


Turbidity

Homework

- **Definition**
- Measure of water clarity. Caused by soil erosion, algae blooms, pollution, bottom feeding organisms.
- **Application**
- High Turbidity = dark water = unsafe
- Low Turbidity = clear water = safer

Turbidity (NTU)



Nephelometric **Turbidity** Unit, measures amount of scattered light.

Invertebrates

Homework

- **Definition**
- Animals without backbones
- **Application**
- Used in the biotic index card

Biotic Index Card Introduction

- Developed by William M. Beck, Jr. in response to the need for a simple biological measure of stream pollution.
- Categorize invertebrates into different classes:

Class I
Pollution Sensitive
Will die, if pollution is largely present

Mayfly

Class II
Moderately Tolerant
Can withstand small amounts of pollution

Aquatic Sowbug

Class III
Pollution Tolerant
Can live even if pollution is largely present

Snail

Biotic Index Calculation

Class I
Pollution Sensitive
Will die, if pollution is largely present

Class II
Moderately Tolerant
Can withstand small amounts of pollution

Class III
Pollution Tolerant
Can live even if pollution is largely present

Biotic Index = 2(n Class I) + (n Class II)

Where **n** is the number of taxa.
The different kinds of species found, not the number of individual invertebrates found.

Example!

Biotic Index = 2(n Class I) + (n Class II)

A sample from the stream reveals the following different kinds of invertebrates:

Organism	# of Taxa (n)	Class
Mayfly	6	I
Stonefly	4	I
Net Spinning Caddisfly	3	II
Aquatic Sowbug	1	II
Snail	1	III

Biotic Index Range	Stream Evaluation
10 or greater	Clean Stream
3 – 9	Moderate Pollution
0 -2	Gross Pollution

Biotic Index = 2(10) + (4) = 24

Biotic Index Card Activity

Directions:

- Work on the Biotic Index Card Activity in your groups.
- Please do your best work!
- Turn in for a classwork-lab grade.