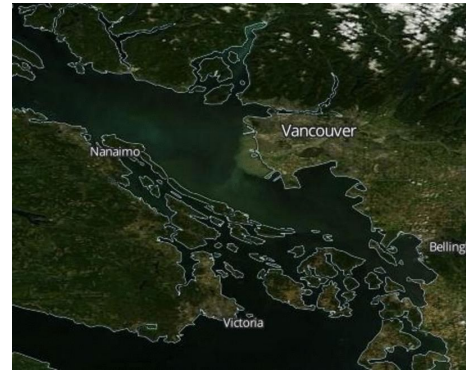


## Topic 3

# pH: Acids and Bases

# Algal Bloom

- When fertilizers are used in fields heavy rains can cause extra fertilizer to run off of the fields into the water system
- When this happens the fertilizer promotes plant growth in lake algae
- Bacteria thrive on this algae and use up the oxygen to break down the algae
- High levels of fertilizer = High levels of N,P,K in lake
- High levels of N,P,K = Increased Algae
- Increased Algae = Decreased Oxygen





# Water Health Indicators

- Good water quality depends on a variety of factors
- Low levels of nitrates, phosphates and potash (potassium) are good for lakes
- High levels of oxygen are positive water health indicators

Good Quality (8-10 ppm of oxygen)	Moderate Quality (4-8 ppm of oxygen)	Poor Quality (0-4 ppm of oxygen)
stonefly nymph	dragonfly nymph	midge larvae
mayfly nymph	damselfly nymph	blackfly larvae
caddisfly larvae	crane fly larvae	pouch snail
water penny beetle	clams and mussels	leech
riffle beetle	sowbug	aquatic worm
gilled snail	crayfish	planorbid snail

Lake A:	Lake B:	Lake C:
120 Stonefly Nymph	20 Leeches	14 clams
20 sowbugs	100 midge larvae	5 leeches
42 gilled snails	6 aquatic worms	24 damselfly nymph

Table 3.5. Water Quality Indicators.

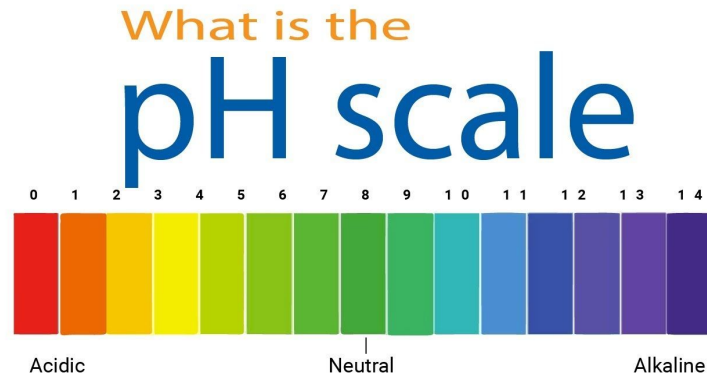
# Bioindicators

- Aquatic or semi aquatic species are often used as bioindicator species
- These species show signs of changes in an ecosystem ex. pH, temperature, pollutants, toxins
- When water becomes polluted the chemicals can seep through the skin and into the eggs of the bioindicator species, causing birth defects



# Chemical Indicators

- pH stands for “power of hydrogen” referring to the amount of hydrogen ions ( $H^+$ ) in a substance
- More hydrogen ions = more acidic substance
- The pH scale is a measure of the acidity or alkalinity (basic) of a substance



# Acids

- pH of  $<7$
- Sour
- Reacts strongly with bases
- Ex. Lemon juice, vinegar



# Neutral Substances

- pH of exactly 7
- Do not react
- Ex. Water, blood



# Bases

- Feel slippery
- React with acids
- Can be corrosive
- Ex. Baking soda, Tums





# pH Tests

- Universal indicators will show a wide range of colours depending on the acidity of the test substance Ex. Phenolphthalein, bromothymol blue, red cabbage, universal litmus paper
- Red litmus paper turns blue in an base, stays red in a neutral substance or acid
- Blue litmus paper turns red in an acid, stays blue in a neutral substance or base



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# Acid Rain

- When organic matter is burned for fuel it releases sulfur, nitrogen and carbon oxides
- These oxides bond with water in the atmosphere to create acids
- The acids created lower the overall pH of the water
- The acidic precipitation can cause damage to ecosystems, crops, and buildings

## Effects of Acid Rain



# Controlling acid precipitation

- We can use neutralization reactions to protect the environment from acid rain
- By adding a base to the environment the acid will be neutralized
- Scientists often use calcium carbonate (limestone) to neutralize acidified lakes in a process called liming



# Controlling acid precipitation con't

- Factories will remove the harmful oxides before they are released into the air by using scrubbers
- Scrubbers are usually wet compounds which are mixed into the harmful gases and react with the oxides
- Cars use catalytic converters to reduce the amount of harmful oxides produced during combustion

