

FACTS ON WATER BASICS AND WATER QUALITY

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Water Basics

- AVAILABLE WATER ON EARTH
 - Salt water
 - Fresh water
 - Ground water
 - Surface water

Saltwater

- Saltwater, is a geological term that refers to naturally occurring solutions containing large concentrations of dissolved, inorganic ions. In addition, this term is often used as an adjective in biology, usually to refer to marine organisms, as in saltwater fish
- 97.5% of the Earth's water is saltwater
- There are 2.2 pounds of salt per cubic foot of water in the ocean
- More information on salt water can be found <http://education.seattlepi.com/top-10-salt-water-ecosystem-4480.html>

Freshwater

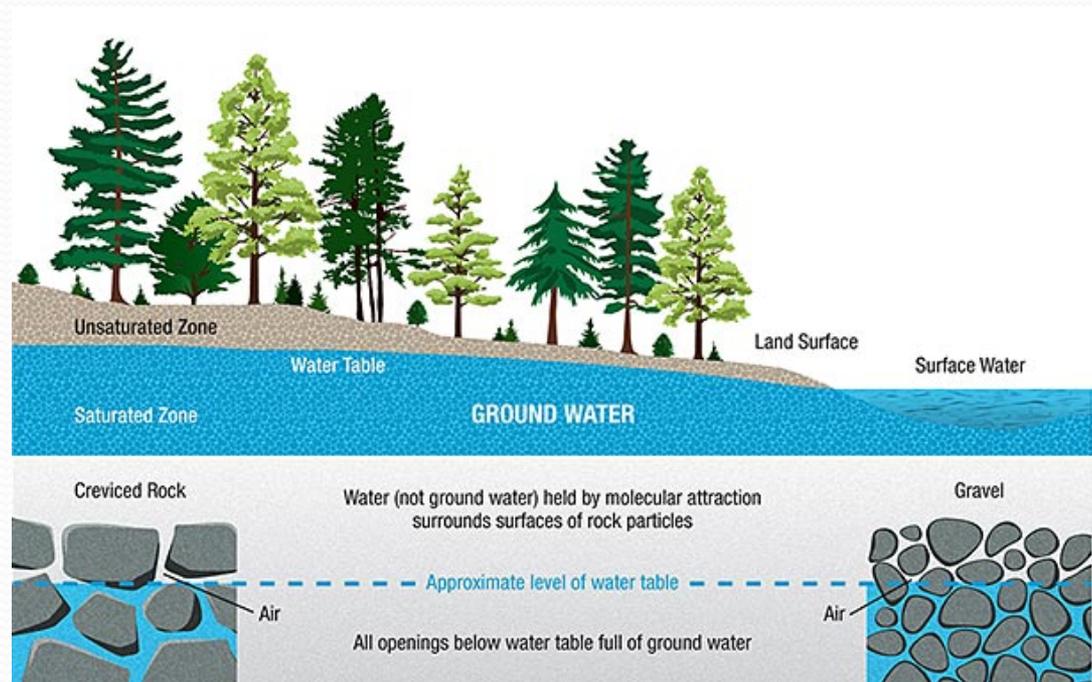
- Fresh water is very hard to find. 3% of Earth's water is fresh water
- 20% of the world's fresh water is contained in The Great Lakes
- About 50-65% of the typical human body is water
- Most fresh water is in glaciers and icecaps
- Click here for more info
<http://water.usgs.gov/edu/watercyclefreshstorage.html>



Groundwater

- Groundwater runs into all different kinds of streams
- 27 trillion gallons of groundwater are withdrawn for the U.S. each year
- 25% of all rainwater becomes groundwater
- Groundwater can be fresh or salty
- More Information:

<http://water.usgs.gov/edu/watercyclegwdischarge.html>



Surface water

- Surface water is water on the surface of the planet such as rivers, lakes, streams, wetlands and oceans.
- 4% of United States' landmass is surface water
- Over 75% of fresh water used in the U.S. is from surface water.
- More Information:

<http://water.usgs.gov/edu/wusw.html>



Water Quality

- Natural Properties
 - color
 - clarity
 - salinity (conductivity)
 - pH
 - hardness (minerals)

Color

- Suspended and dissolved particles in water influence color.
- These particles include things like leaves and algae.
- Leaves release tannin.
- Example: When boiling tea, the leaves change the water's color

Color caused by dissolved matter: tannins



Color caused by suspended material: sediment



Clarity



- A measure of the amount of sunlight that can penetrate through the water
- Water clarity is important so the sun can reach the water plants. They can grow and provide oxygen for everything else underwater
- To measure water clarity you use a secchi disc. You color the opposite sides black and white, then lower it on a rope to see how far you can see the disc in the water



Salinity and pH

- Salinity means, the saltiness or dissolved salt content of a body of water
- Salts are highly soluble in surface and groundwater and can be transported by water movement
- pH is a numeric scale used to specify the acidity or alkalinity of water
- The scale is from 0-14
- 0-6 is acid, 7 is neutral, 8-14 is a base

Sources of water pollution

- Point sources:
 - Industrial discharge
 - Treated sewage
- Non-point source
 - Farms
 - Forest harvesting
 - Urban areas
 - Atmosphere deposition
 - Road salt

Types of non-point source pollution

Nutrients:

- Eutrophication
- Too many nutrients are bad because they feed algae
- Then the algae dies and breakdown and sucks the oxygen out the water and kills all the aquatic creatures
- Example: when people put to much fertilizer on their lawns it can get washed away into lakes, and rivers



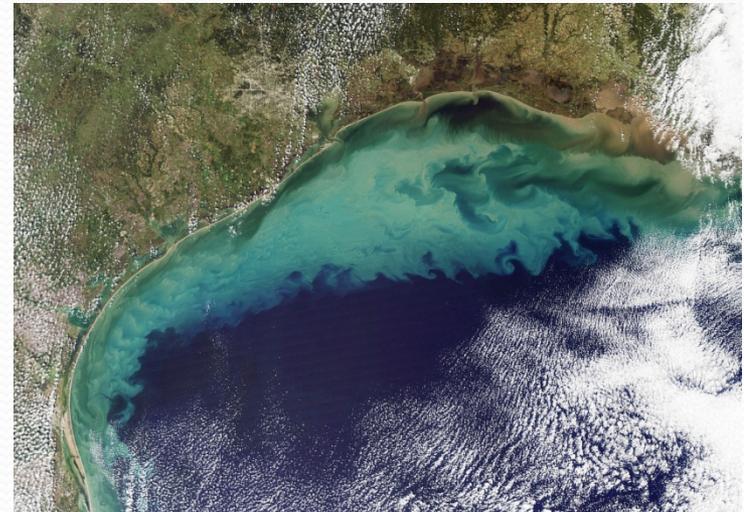
Eutrophic dam – algae on surface, sludge and sediment on bottom

Treated dam – algae eliminated, sludge and sediment on bottom digested and removed

Types of non-point source pollution

Sediment:

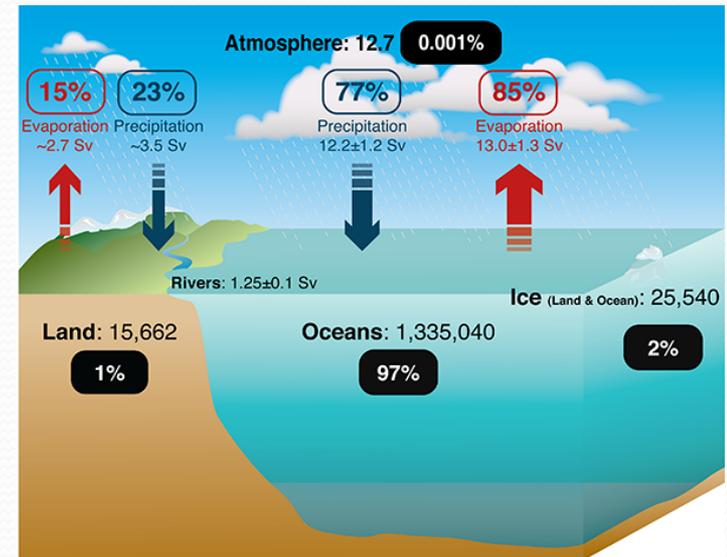
- Sediment is the matter that settles to the bottom of liquid, or may be suspended
- Sediment is bad because it blocks light from the aquatic plants.
- Sediment is important because it often enriches the soil with nutrients.
- Areas rich in sediments are often also rich in biodiversity.
- Sedimentary soil is usually better for farming.



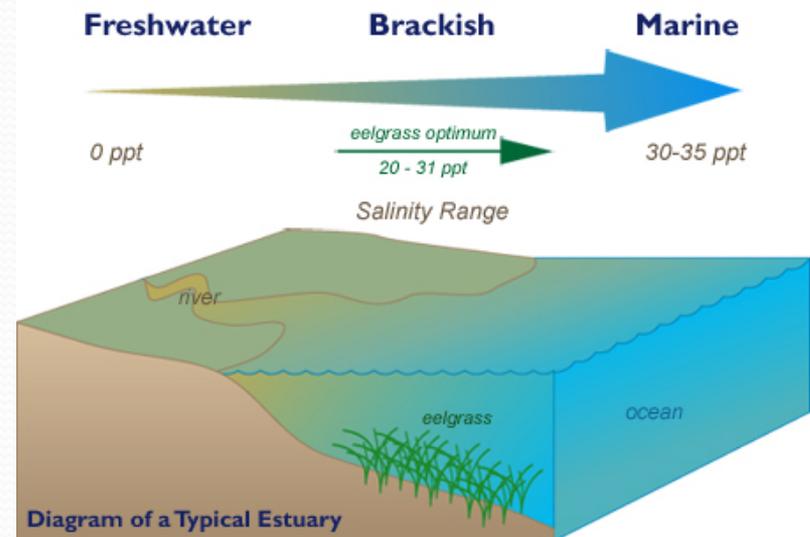
Types of non-point source pollution

Salinity:

- High salinity is bad because when we need drinking we are not able to safely eliminate excessive salt.
- High levels of salts may affect the taste of drinking water.
- Chloride in particular has a low taste threshold.
- High sodium and magnesium sulfate levels in drinking water may produce a laxative effect and reduce the suitability of a water supply for grazing animals, insects and fish.
- Road salt, for melting ice in winter, is the primary source of excess salinity in central Maryland surface streams and lakes.



Reservoirs represented by solid boxes: 10^3 km^3 , fluxes represented by arrows: Sverdrups ($10^6 \text{ m}^3 \text{ s}^{-1}$)
Sources: Baumgartner & Reichel, 1975; Schmitt, 1995; Trenberth et al., 2007; Schanze et al., 2010; Stoffen et al., 2010



Types of non-point source pollution

Bacteria:

- Bacteria are microscopic living organisms, usually one-celled, that can be found everywhere.
- They can be dangerous, such as when they cause infection, or beneficial, as in the process of fermentation (such as in wine) and that of decomposition.
- The bad thing about bacteria is that after it rains, disease causing bacteria wash into surface waters increasing risks for swimmers.
- These bacteria come from pet waste, farm animal manure and failing septic systems.

