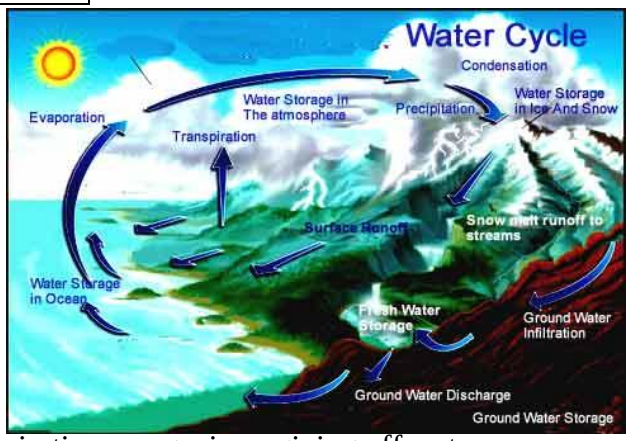
EARTH'S HYDROSPHERE



The Water Cycle:

There is a continuous movement of _____ from the atmosphere to the earth's _____ and then back to the _____. This cycle of water movement is called the _____ or the _____.

_____: evaporation and transpiration = organisms giving off water vapor

_____: water flowing into rivers

_____: water soaking into the ground

_____: water vapor turning into liquid water

_____: water falling to Earth- snow, rain, etc.

Water Budget:

The continuous _____ of evapotranspiration, condensation and precipitation gives the earth its _____.

- Expenses:
- Income:

Factors affecting the **local** water budget:

-
-
-
-
-

Compare & contrast the global water budget to a local water budget?
(use both words AND diagrams)

Water Conservation

Scientists have identified ____ approaches that can be used to ensure there is _____ for the future.

1. _____: antipollution laws; education on water conservation
2. Finding other supplies of water:
    - _____: process of removing salt from ocean water.

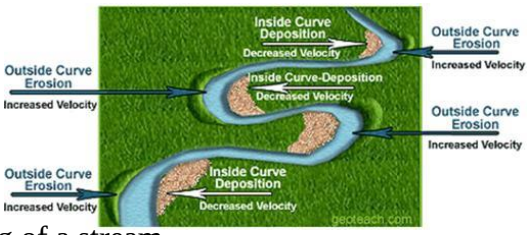
River Systems:

A river system is made up of a _____ and all the feeder streams, called _____, that flow into it.

_____: land from which water runs into stream (aka drainage basin)

_____: elevated areas of high ground. Separate watersheds

A river system begins to form when local _____ exceeds _____. The _____ soaks up as much water as it can. _____ causes excess water to move _____ as _____.



Stream Erosion

The path that a stream follows is a _____.

_____: lengthening and branching of a stream

_____: "capture" of one stream by another

Channel Erosion

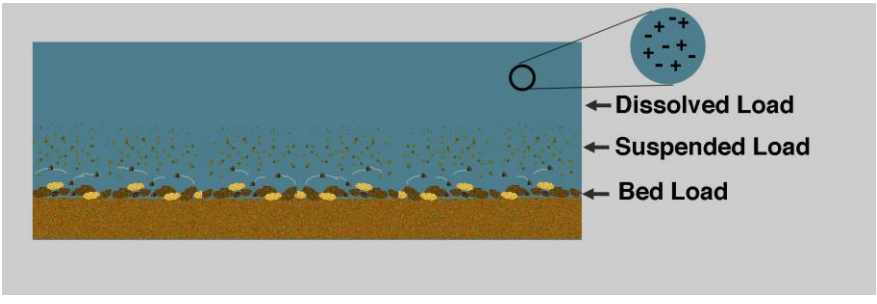
The edges of a stream that are above water are called _____. The part of the stream channel that is below the water level is the _____. A stream gradually becomes _____ and _____ as it erodes.

Stream Loads

Materials that are carried by a stream are known as the _____.

Stream Load	Size of Particle	Rate of Stream Erosion
Dissolved Load		
Suspended Load		
Bed load		

_____: bowl-shaped cavity caused by erosion



Discharge and Gradient

A stream's ability to cut down and widen channel is effected by _____,

_____, and _____.

A _____ moving stream carries more _____ than a slow moving stream

_____: volume of water moved by a stream

_____: steepness of slope

_____: beginning of a stream

Water and Wind Gaps

Movements of the earth's crust can _____ or_____ the surface of the land, and affect

_____.

1. _____: Water eroded notch in a mountain through which no water can flow.
2. _____: Deep notch left where a stream erodes through mountains where the land is uplifted.

Stages of a River System

The development of a river is divided into ___ stages - _____, _____, and

_____.

_____ Rivers

- few tributaries
- small volume of water
- not much meandering (curving)

Create a labeled sketch of EACH river stage. Be sure to clearly show the differences between each stage.

_____ Rivers

more tributaries

more water (large volume)

some meander

_____: curving of rivers

_____: a lake is formed from a meander

_____ Rivers

many tributaries

broad, flat plains

lots of meanders

_____ **Rivers-** a river that gains steep gradient by some shift in the land

Stream Deposition:

The total load a stream can carry is _____ when a large _____ of water is flowing. When the _____ decreases, the ability of the stream to carry its load also _____. As a result, part of the stream load is _____.

Deltas and Alluvial Fans

Most of the _____ carried by a stream is _____ when the stream reaches a _____.

_____: fan-shaped deposit at mouth of river

_____: fan-shaped deposit at bottom of slope on land

Compare & contrast a delta and an alluvial fan. Create a sketch that clearly shows these differences.

Flood Deposits

The _____ of a stream channel is determined by the average _____ of water that flows in the _____. The part of the _____ that may be covered with water during a _____ is called the _____.

_____: water released by melting snow

_____: ice blocking stream channels

_____: deposits along banks of streams

Why do people choose to live on floodplains?

List some examples of floodplain development projects in NC.

Flood Control Methods:

-
-
-

Groundwater and Erosion

Water Beneath the Surface:

Water that seeps into the upper layers of the earth's crust is called _____.

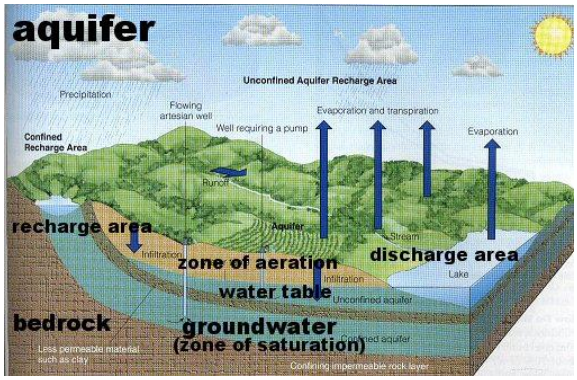
- _____ % of earth's freshwater is underground.
- In the US, groundwater supplies _____ % of the freshwater needs.
- Amount of groundwater is _____ times greater than that of rivers and streams.

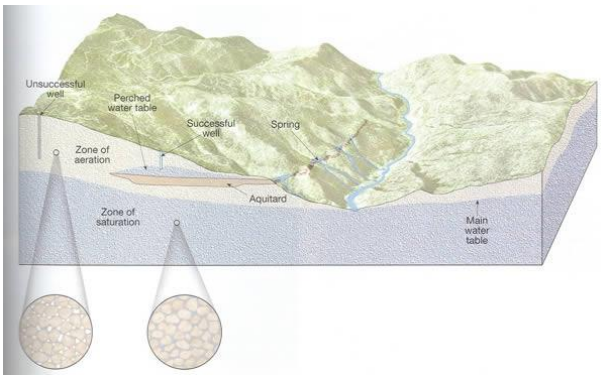
_____: a body of rock through which large amounts of water can flow and in which much water is stored.

The quality of the aquifer depends on:

1. _____ - the amount of water that a rock can hold, refers to the amount of open space present
   - The main influence of porosity is _____
   - Well sorted soil – particles are all the _____ size
   - Poorly sorted soil – particles are all _____ sizes
2. _____ - indicates how freely water passes through the open spaces, the spaces must be _____
   - If water cannot flow through the rock, it is said to be _____. (aka _____)

_____ pulls water down through the rock until it reaches an impermeable layer. Water then begins to _____ the pore spaces above the impermeable rock.





_____ - area above the impermeable layer where the pore spaces are filled with air.

_____ - area directly above the impermeable layer where the pore spaces are filled with water.

_____ - the upper part of the zone of saturation

Groundwater can be polluted by:

-
-
-
-

Groundwater can be CONSERVED by:

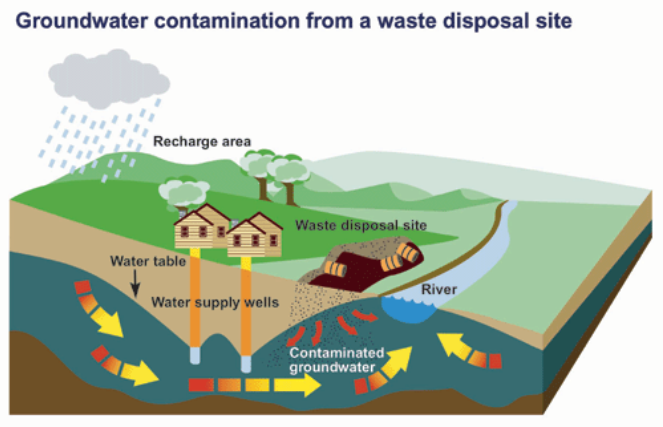
-
-
-

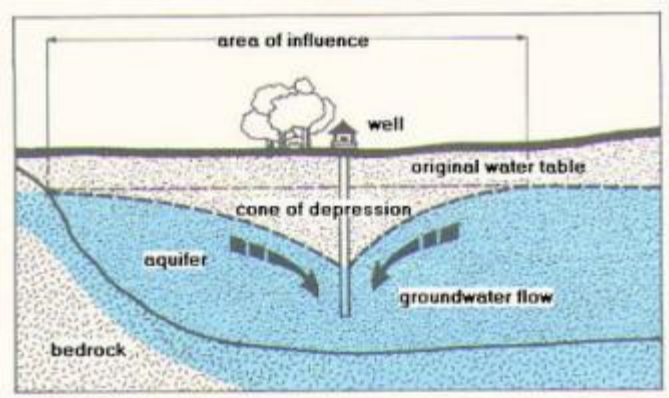
Wells & Springs:

Two ways that groundwater comes to the surface are:

_____ - a hole that is dug below the water table and then pumped to the surface

_____ - a natural flow of groundwater found where the ground dips below the water table





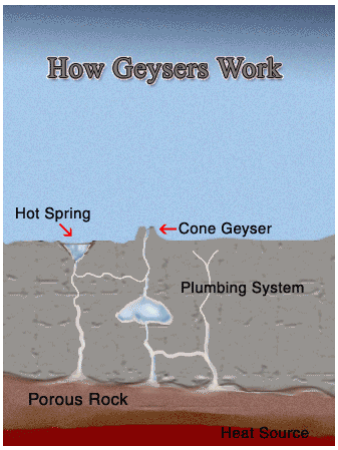
Two main types of wells and springs:

1. _____ - as described above
2. _____ - one through which water flows freely with no pumping required. This requires that the water is trapped between two _____ layers. The impermeable layer on top is known as the _____. Once the cap rock is penetrated, the water trapped below flows freely to the surface.

The area of the water table around a well often dips down and is known as a _____.

Create a sketch that includes both an ordinary well AND an artesian well. Show & label the layers underground that create the differences between these two types of wells.

_____ - groundwater that is heated below ground and then flows to the surface. It is often heated by recent _____ activity or is near pockets of _____. Hot springs that erupt periodically are known as _____. (Ex. _____)



Groundwater and Chemical Weathering:

As water passes through rock, it _____ minerals. The _____ the rock and water are, the more minerals that will dissolve.

_____:

- Contains minerals (such as calcium, magnesium, iron)
- Can damage household appliances

Results of Chemical Weathering by Groundwater

_____ - a large underground chamber, hollowed out by the action of water

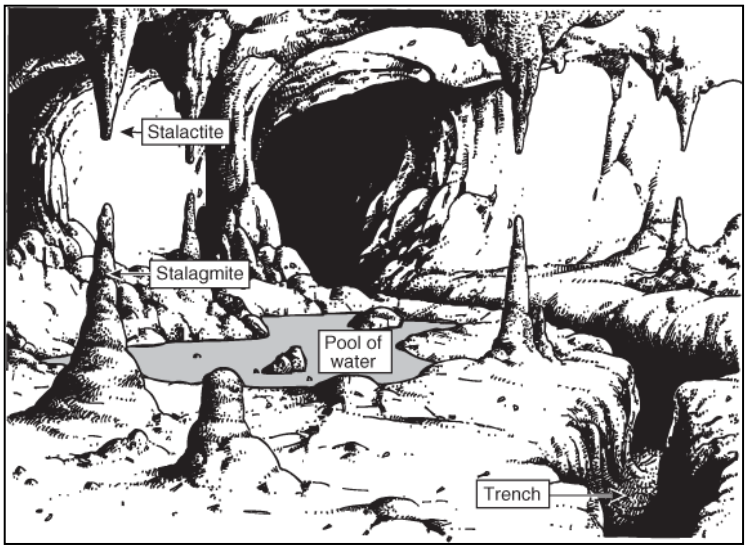
_____ - circular depression caused when the roof of a cavern collapses

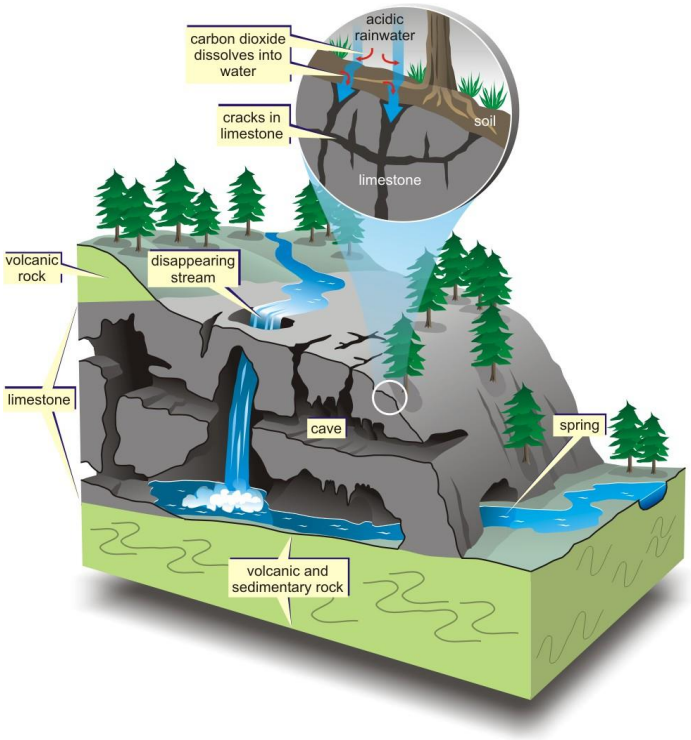
_____ - cone shaped deposit suspended from the ceiling of a cavern

_____ - cone shaped deposit built up from the floor of a cavern

_____ - an arch of rock formed by groundwater erosion (two open places on either side)

_____ - region where the effects of chemical weathering due to groundwater, such as sinkholes and caverns





OCEANS

Properties of Ocean Water

Water is the basic substance into which _____ and _____ are dissolved. This solution is called _____ or _____. Besides dissolved substances, small particles of _____ and tiny _____ may also be suspended in ocean water.

_____ - enables dissolving of substances
_____ - temperature, density and color

Composition of Ocean Water:

1. _____ - water evaporating and leaving solids (salts) behind
2. _____ - enter directly from the atmosphere

Elements: 96.5% _____, 2% _____, 1.5% _____
3 Dissolved Gases: _____, _____, _____ (dissolves most easily)

Salinity of Ocean Water:

- The amount of _____ present in ocean water is known as _____.
- This is increased by both _____ and _____.
- Most of the oceans have salinity ranging from _____% to _____%. However it can vary greatly (ex. Red Sea = 40%).

Temperature of Ocean Water

The _____ directly heats the _____ of the ocean.

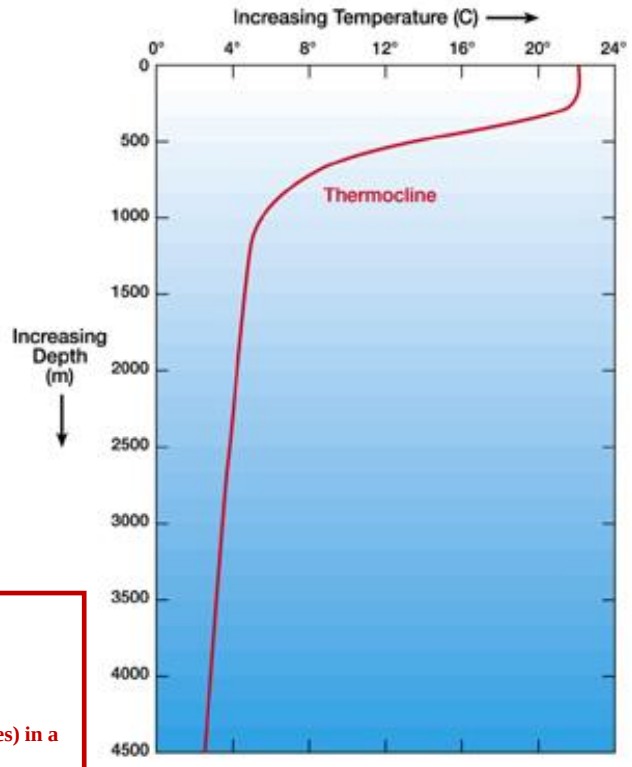
In deep zones, the temperature of the water is usually about _____ (just above the -2 degree freezing point).

_____:

- Movement of ocean water mixes the warm surface waters
- More solar energy falls at the equator than the poles
- Ocean water freezes at -2 ° C

_____:

- Zone of rapid temperature change
- Warm and cold water do not mix
- Below the thermocline, the temperature of water still falls – but VERY slowly.



1. Where on Earth are the oceans with the highest salinity levels? WHY?

The lowest salinity? WHY?

2. What effect does the thermocline have on the biodiversity (number of different species) in a given area?

_____ dense as it becomes warmer.

- The most dense water is found at the _____. Water is most dense at 4° C.

Color of Ocean Water:

- The color of ocean water is determined by the way it absorbs or reflects _____.
- Only the _____ wavelengths tend to be reflected.

No light of any kind can pass through ocean water at depths below 200 m. Only the upper regions show color. The rest is in total darkness.

What two factors affect the density of ocean water? Specify which is high density and low density for each factor.
FACTOR 1: _____ FACTOR 2: _____
High = Low = High = Low =
What is the significance of 200m?
What is the name given to the zone of water ABOVE 200 m? Below 200m?

Ocean Currents

The waters of the ocean move in giant streams called _____. Oceanographers know that there are two major types of currents:

1. _____ - move on or near the surface
2. _____ - move much more slowly deep beneath the surface

Surface Currents

Ocean water can be set into _____ only if it receives _____. The driving force behind ocean currents is the _____.

3 Factors Affecting Ocean Surface Currents:

1. _____ - push currents in the same direction of the wind movement
2. _____ - ocean moves with the earth's rotation
3. _____ - act as barriers to currents

The _____ also is a major factor controlling surface currents. This is the deflection of the winds and ocean currents caused by Earth's rotation. This causes huge circles of moving water to form.

_____- two warm currents that are found in the three main oceans and move _____.

Between them is a weaker _____ flowing current called the equatorial countercurrent.

_____ - a swift warm current that pushes water through the Caribbean Sea & Gulf of Mexico and moves up the east coast of the United States.

_____ - very slow moving warm current forms as the Gulf

_____ - vast area of relatively calm water

Currents in the northern hemisphere move in a _____ direction and the southern hemisphere move in a _____ direction.

Deep Currents

In addition to _____ surface currents, the ocean has

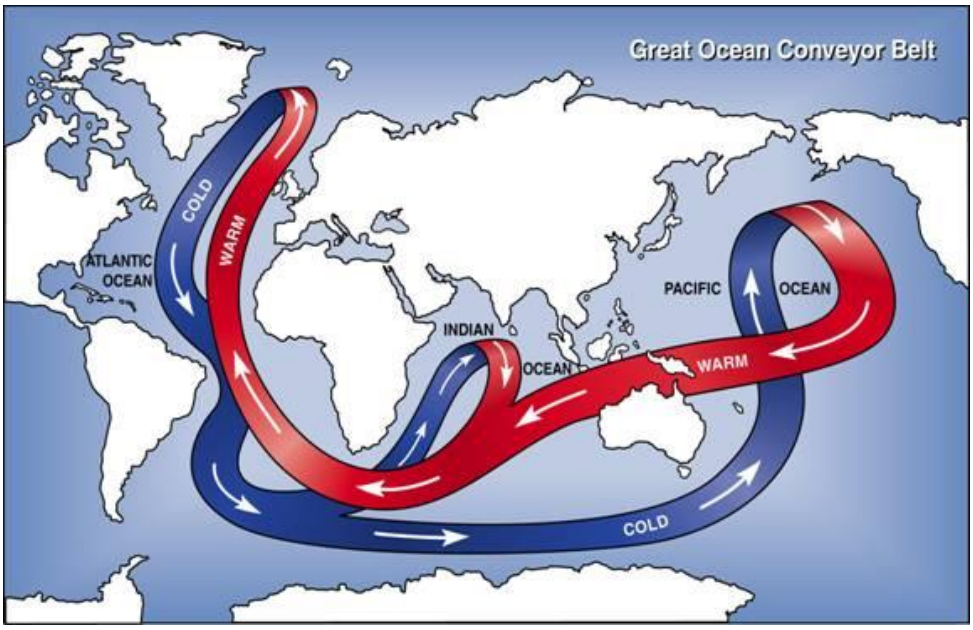
_____ currents that flow very slowly, deep beneath its surface.

The movements of these polar waters is a result of differences in _____.

The higher _____ of polar waters is also a result of an increase in the

_____.

- _____ - close to freezing, 3.5% salinity
- _____ - exceptionally cold and highly dense, causes a movement of warm less dense surface water to move into the Mediterranean.
- _____ - strong currents caused by underwater landslides, “carve” out deep submarine canyons on the continental slopes.

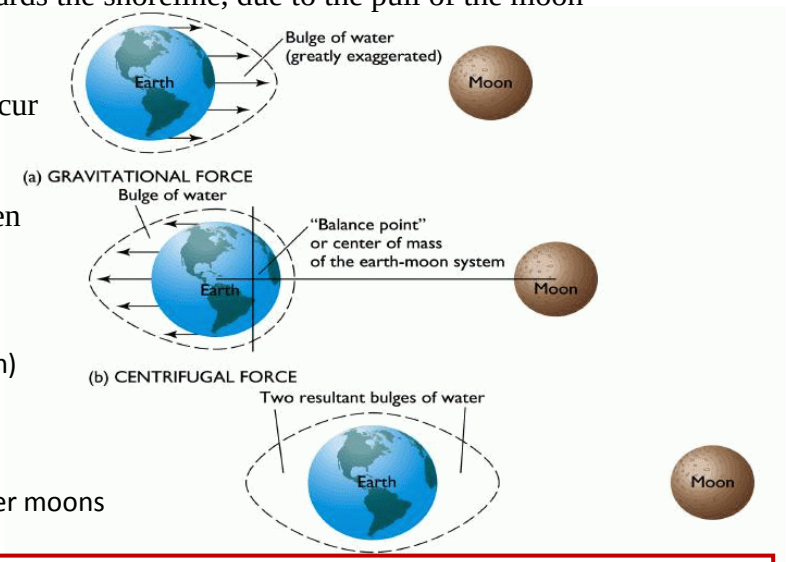


Tides

The daily changes in the level of the ocean surface are known as _____. According to Isaac _____, the gravitational pull of the _____ on Earth is the main cause of tides.

_____ - form halfway between high tides, ocean water flows away from the shore

_____ - water moves towards the shoreline, due to the pull of the moon



Behavior of Tides

If the earth did not move, then tides would always occur In the same place.

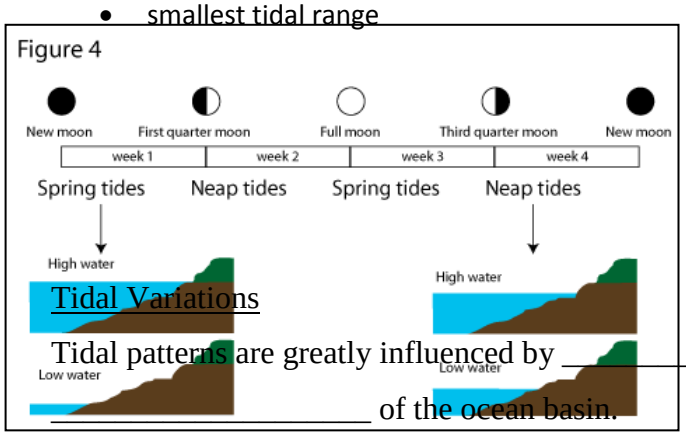
_____ - difference between the level of high and low tides.

_____ -

- occur during a new and full moon (twice a month)
- largest tidal range

_____ -

- also occur twice a month during 1st and 3rd quarter moons
- smallest tidal range



Draw the Earth-Moon-Sun alignment for each of the following:

SPRING TIDE	**NEAP TIDE**

Tidal Variations

Tidal patterns are greatly influenced by _____ _____ of the ocean basin.

_____Tidal Patterns: 1 high and 1 low tide per day (ex. Gulf of Mexico)

_____ Tidal Patterns: 2 high and 2 low tides per day (ex. Atlantic Ocean)

The greatest differences in tidal oscillations (change between high and low tide) create the largest _____ _____ and are found in the narrow V-shaped Bay of Fundy, located in _____.

Tidal Currents

_____ - tidal currents flowing toward the ocean

_____ - tidal currents flowing toward the shoreline

_____ - time between ebb and flow tides

_____ - surge of water rushing upstream when a river enters the ocean through a long bay

Features of the Ocean Floor

The ocean floor can be divided into ___ major areas. The _____ are shallower portions of the ocean and are made of continental crust. The _____ is made up of oceanic crust.

Continental Margins:

The line that divides the _____ from the _____ is not always obvious. _____ are not the true boundaries.

_____

- Zone of shallow water bordering continents
- Slopes gently from shoreline
- A "smoother" version of land surface above the shoreline

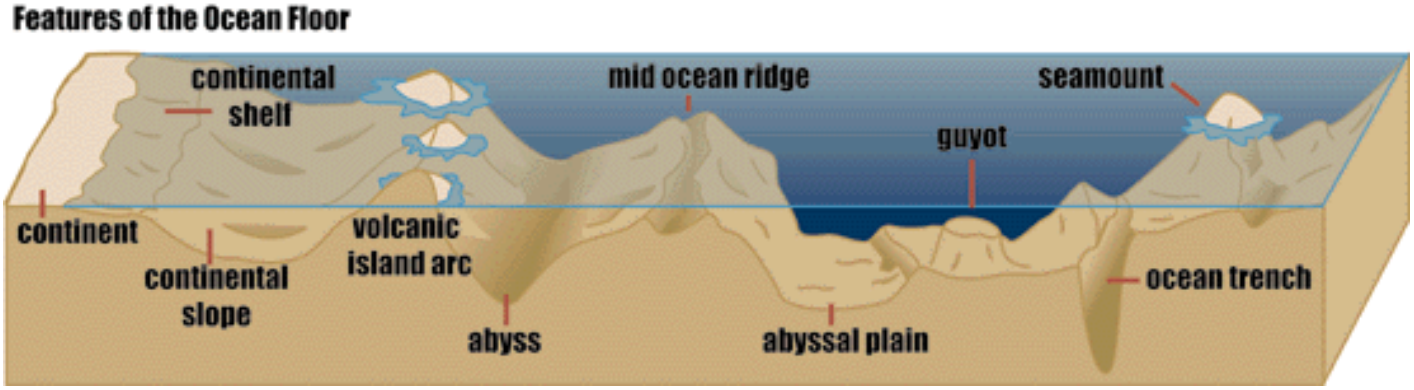
Create a LABELED sketch that shows all the features of the continental margin.

_____

- Seaward edge of continental shelf
- Ocean depth increases quickly
- _____ - dense currents with large amounts of sediment
- _____ - raised wedge at the base of continental slope
- _____ - deep valleys in continental slope

_____

- In the deep ocean basin, the _____ are higher and the _____ are flatter than any found on the continents.
- _____ - deepest feature on Earth's surface (ex. Mariana Trench = 11,000 m deep)
- _____ - cover half the entire ocean basin, flattest region on Earth
- _____ - connected underwater mountain range
- _____ - isolated mt ranges, form _____ over time



Erosion by Wind & Waves

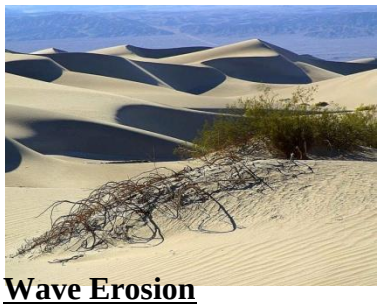
Wind Erosion

Wind has energy. That energy can be used to push a sailboat, turn turbines, and erode the land.
Wind can erode _____ land better than _____ wet land because the water in wet land holds the _____ together.
As the wind erodes, it carries rock particles along. There are two types:

NAME	SIZE	SOURCE	MOVEMENT
	0.06 mm – 2mm		_____ - series of "jumps" because particles are heavy
	< 0.06 mm		Lifted by wind and carried in the air

_____ - when wind removed the top layer of fine, very dry rock or soil particles (leaves large rocks behind)

Two types of wind deposition:



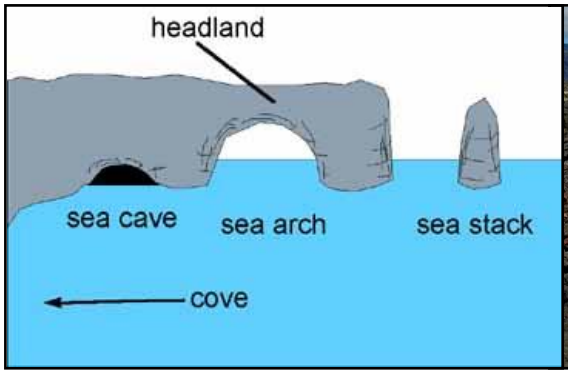
1. _____ - mounds of wind-blown sand
2. _____ - thick yellowish deposit of wind-blown sand

Wave Erosion

Shoreline Erosion – The land bordering an ocean can be eroded in two main ways:

1. _____ - the striking force of the waves can break off pieces of rock and carry them back to the shore.
2. _____ - salt and air get into the cracks and will chemically break down the rocks.

Some of the features formed as a result of these processes include sea cliffs, sea caves, arches, stacks and terraces.

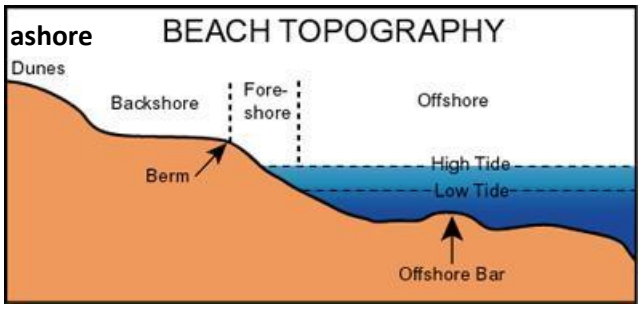


_____ - a deposit of sand or larger rock fragments along an ocean shore or a lakefront

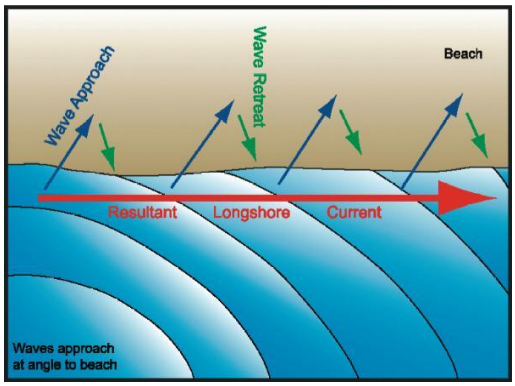
The composition depends on two factors:

1. _____ - the type rock in the surrounding area
   - _____ = light colored fragments (common in N. America)
   - _____ = dark colored (black sand beaches in Hawaii)
2. _____

   - **Rivers and streams** may carry the source rock to shore
   - Some beaches are made of **shells and coral that washed ashore**
   - **Glaciers** may have deposited it



_____ - area people use for recreation



_____ -

Waves generally hit the shore at an angle, BUT longshore currents move parallel to the shoreline. These form shoreline features known as spits and tombolos

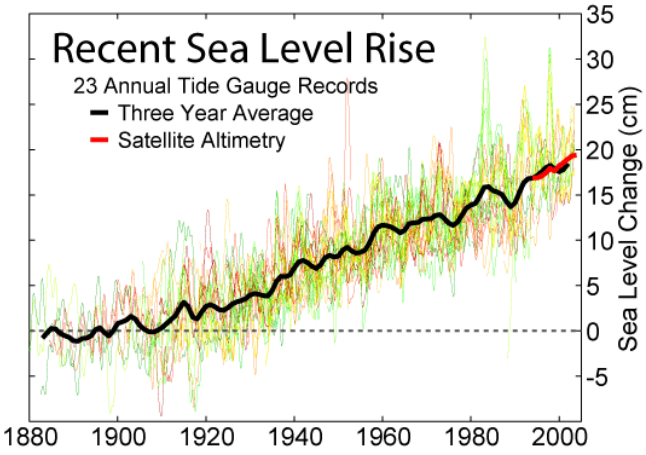
Coastal Erosion and Deposition

While coastal features vary, most are formed by a change in _____ relative to the _____.

Sea level greatly affects the appearance of the coastline.

_____ - the average of high and low tides measured over many years

Sea level is currently rising at a rate of _____ (according to the IPCC report of 2007). This change is mainly because of the _____.



Submergent Coastlines:

Land can rise or sink because it is floating on the asthenosphere. Highest parts of submerged land can form islands. These features are re-shaped over time due to erosion.

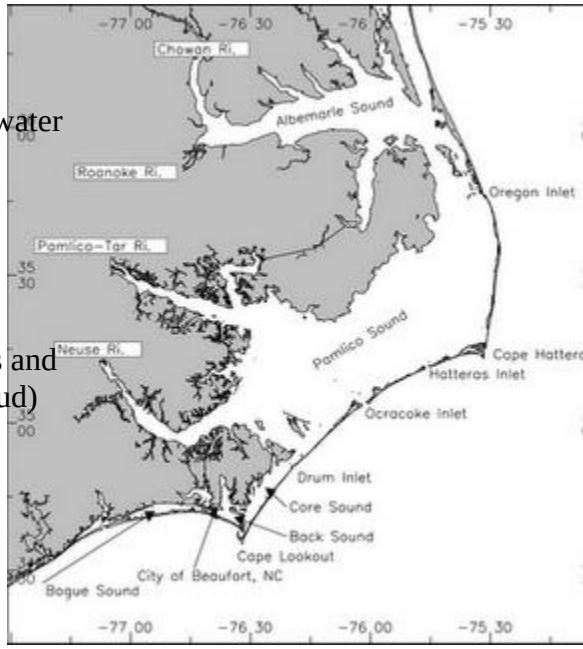
_____ - when the mouth of a river gets submerged by ocean water, forming a wide shallow bay

Characteristics include:

-
-
-

_____ - salty and freshwater mixed

_____ - refers to the amount of salt content in the water (higher salinity = higher salt content)



Coastal Features:

_____ - long narrow offshore ridges of sand

_____ - body of water between the barrier islands and the shoreline (shallow water with lots of mud)

Why are barrier islands particularly subject to erosion?

Preserving the Coastline:

While only ____ % of the United States is coastal, approximately _____ % of the population lives in coastal areas.

We use coastal areas for:

Coastlines are in danger from: