Intermediate Science 8

Unit 1:

Water Systems on Earth

Chapter 2 and 3

Science 8

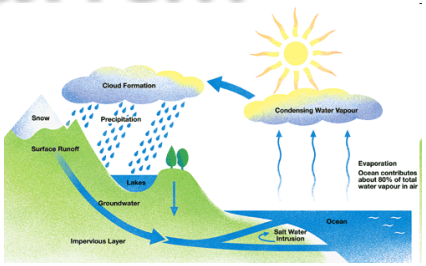
Unit 1:

Topic 5: Introduction to Oceans

WATER SYSTEMS

Oceans are important...

1. Primary water source for the water cycle



2. Control weather

3. Support diverse life

4. Provides humans with food, minerals, and resources

Ocean Basins

Ocean Basins refers to low spots in the earth surface in which water has flowed into and accumulated over millions of years.

The five Major oceans are (Largest to smallest):

1) Pacific Ocean Basin
2) Atlantic Ocean Basin
3) Indian Ocean Basin
4) Southern Ocean Basin
5) Artic Ocean Basin

Figure 11.1 Earth's oceans

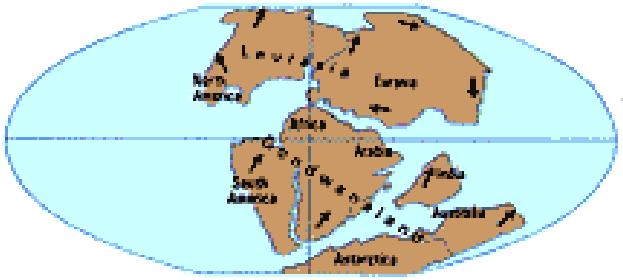
The Four Factors That Formed Oceans

1. Tectonic Plates
2. Volcanic action
3. Erosion
4. Glaciation

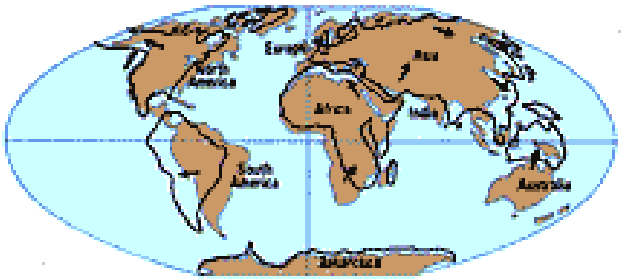
1. Tectonic Plates

Pangaea: The supercontinent 200 million years ago

The land masses after 65 million years of drift



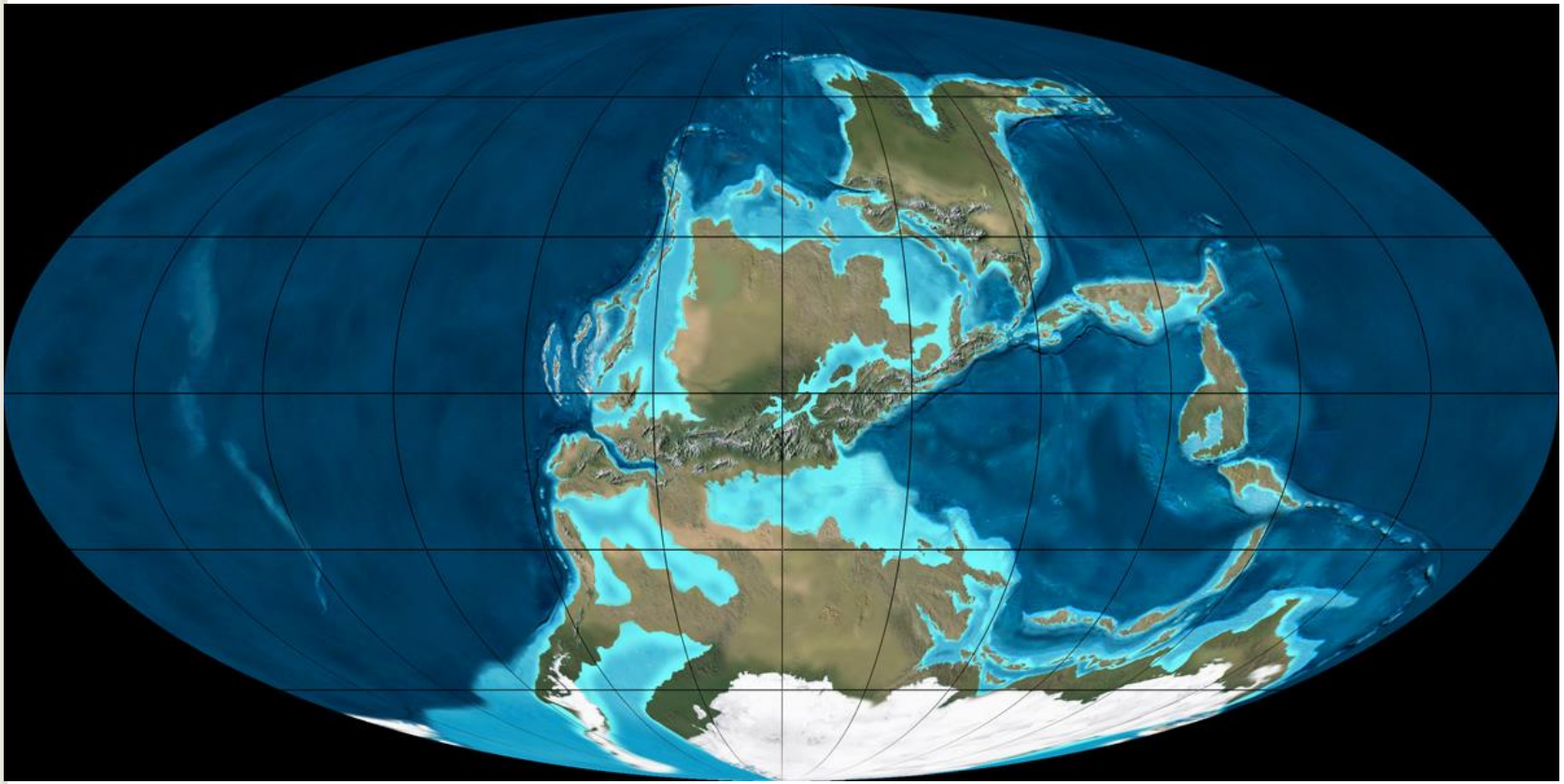
The continents today and 50 million years from now



Over 200 million years ago, all of the continents were together in one land mass called Pangae

Rest of the earth was covered by one giant ocean called Panthalassa

Earth is made up of large, slow moving sections of rock called tectonic plates

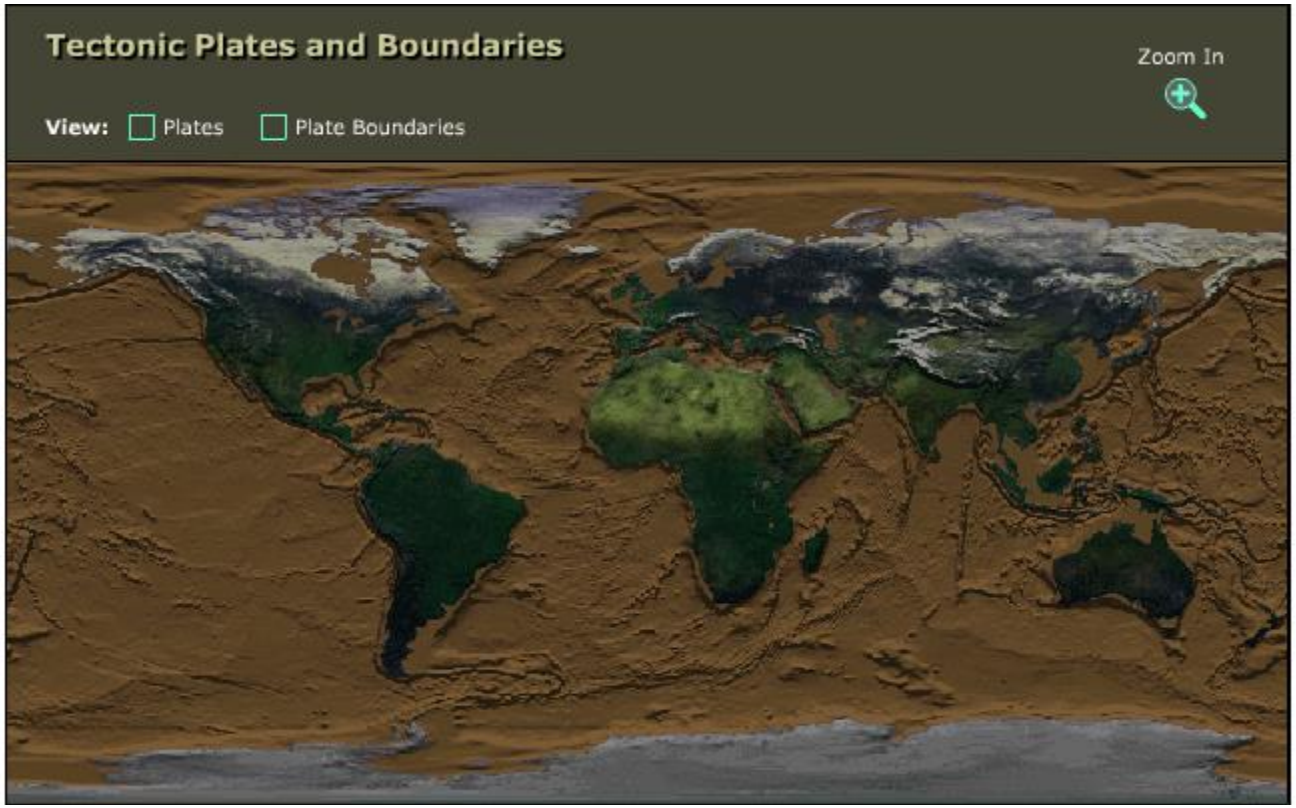


Panthalassa... Oceans then

Oceans now

- Tectonic Plates Have helped determine where ocean basins are located.

- Tectonic plates move changing the position of the continents



The tectonic plates float over a layer on molten rock called magma. Pressure buildup from the magma is causing the plates to move (Pacific Ocean is shrinking, Atlantic is getting larger

Gros Morne National Park: Tablelands Provide evidence of tectonic plates

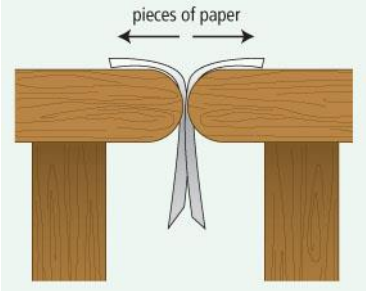
Read page 52

UNESCO declared Gros Morne National Park a **world heritage site** in 1987

Student Activity

- Page 41

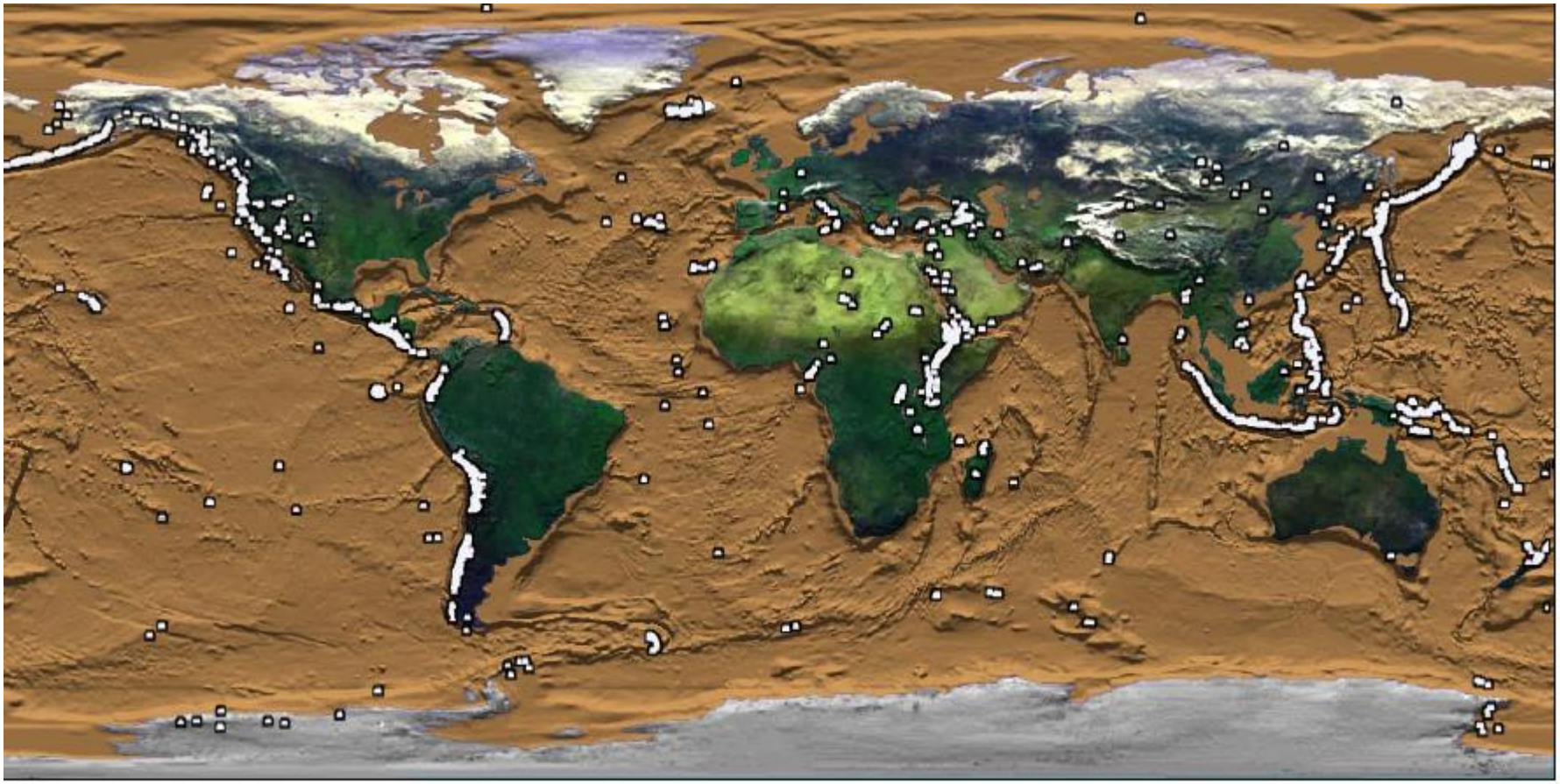
How ocean Basins are becoming bigger?



Student Work

- Page 45 #1, #2, #3

World Map With Volcanoes



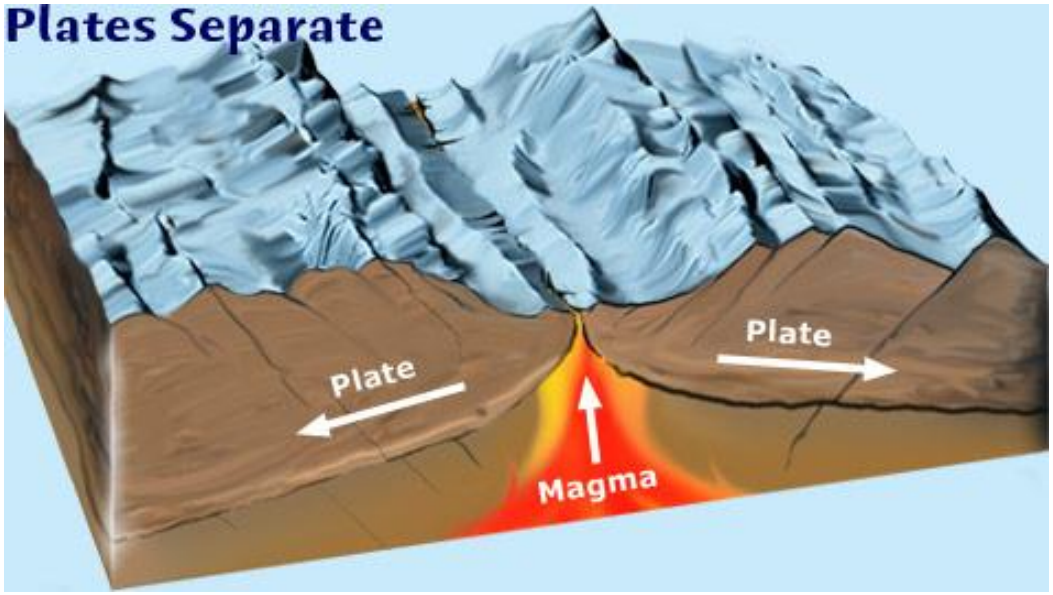
☐ White areas with black outlines represent volcanoes

Base Map Courtesy of NASA/Goddard SVS
Volcano Overlay © 2006 UNAVCO

2. Volcanic Action

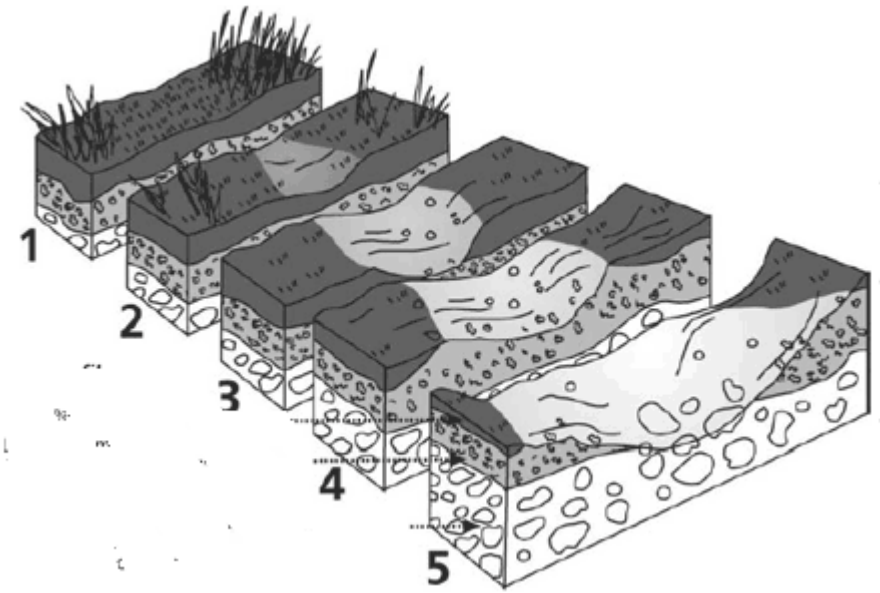
- Volcanic action has built ocean floor along mid-ocean ridges in areas where plates separate.

- Has helped build continental divides in areas where plates have collided and mountain building occurs.



3. Erosion

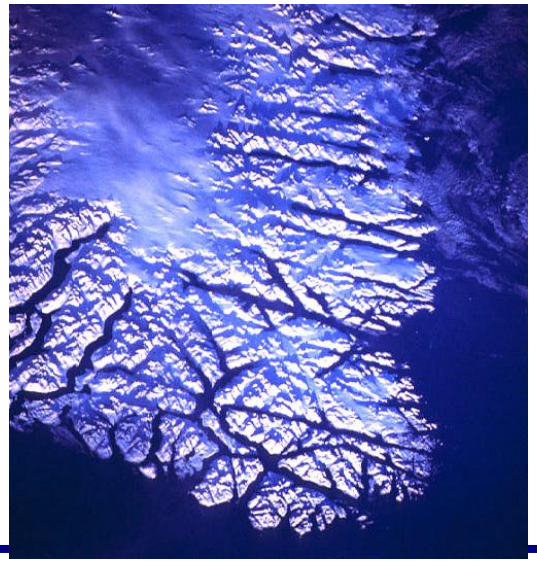
- Erosion has aided the further development of continental drainage systems as material is removed and deposited into the ocean basins.



4. Glaciation

- A force of erosion in the development of continental drainage systems.

- Glaciers move materials towards the oceans.



Two Origins of Ocean Water

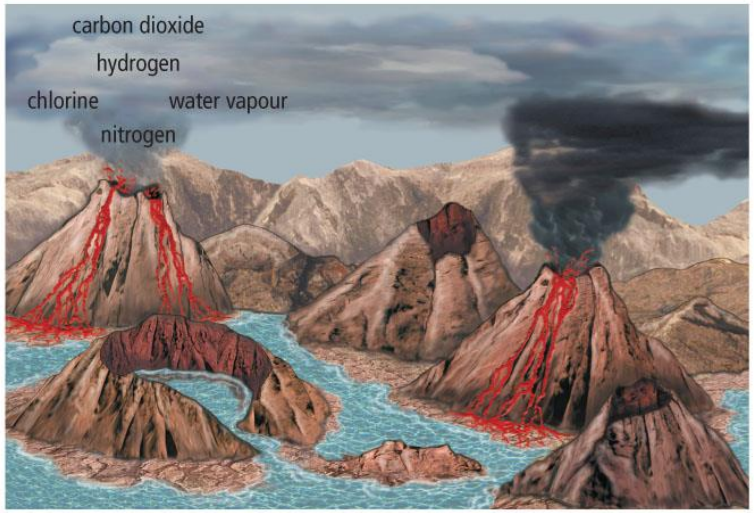


Figure 11.2 Volcanoes helped form Earth's oceans.

1) Outside of Earth cooled but the inside remained hot. Water trapped in volcanic materials was released as vapour. It cooled, condensed and fell back to the earth. This water collected in the lowest parts of the Earth's surface...the ocean basins.

2) From ice in comets that stuck the Earth

Hudson Bay Lowlands, Ontario

Science 8

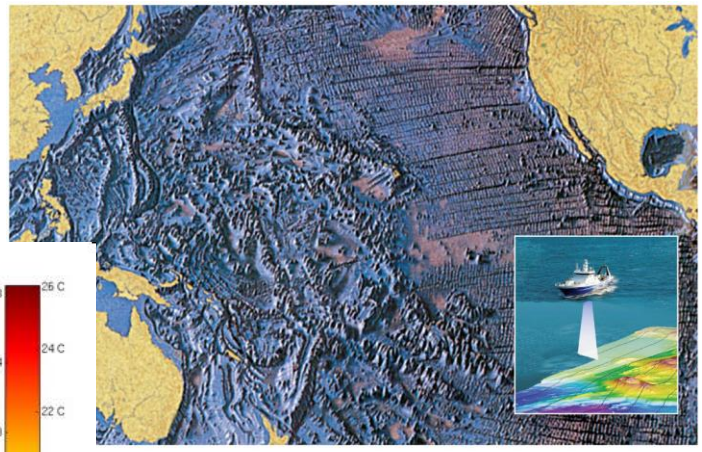
Unit 1:

Topic 6: Exploring the Ocean Floor

Researching the Ocean Floor

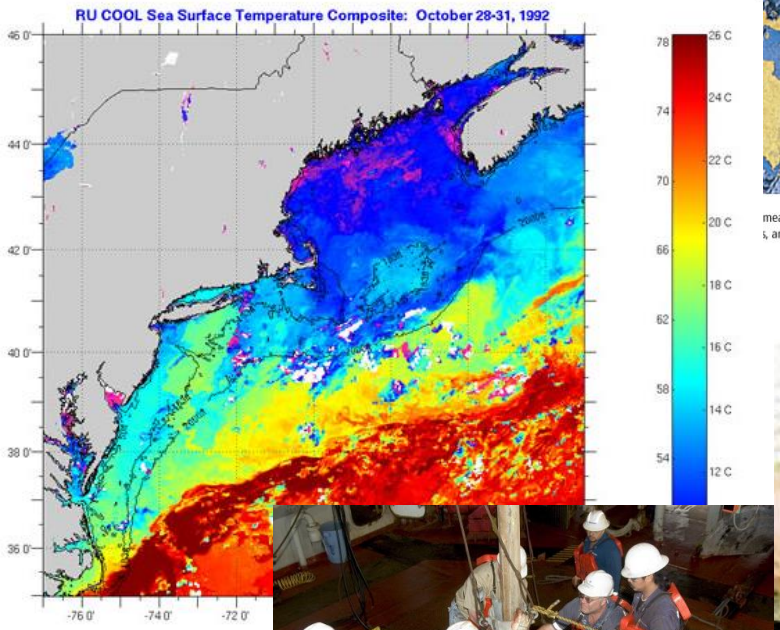
Technologies include...

1. Sonar (Sound Navigation Ranging)



measuring the reflection (echo) of sound waves bouncing back from the ocean bottom, scientists have been able to map
, and canyons on the ocean floor.

2. Satellites



3. Core sampling

Researching the Ocean Floor

Technologies include...

1. Sonar (Sound Navigation Ranging): Use sound waves to probe the seabed

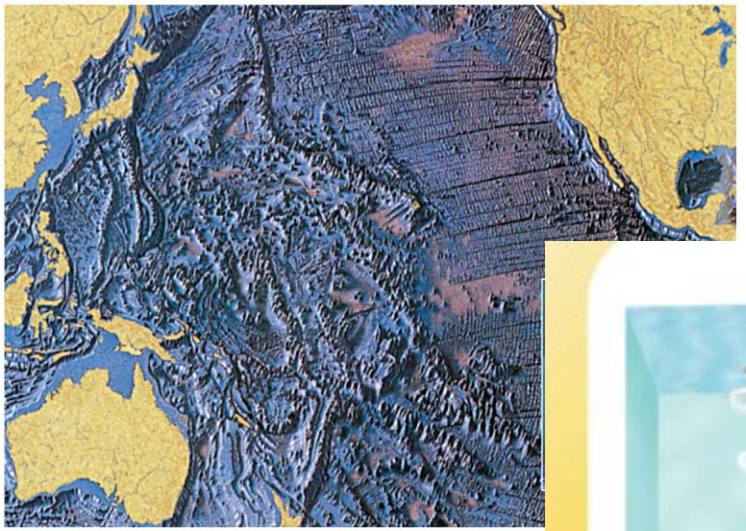
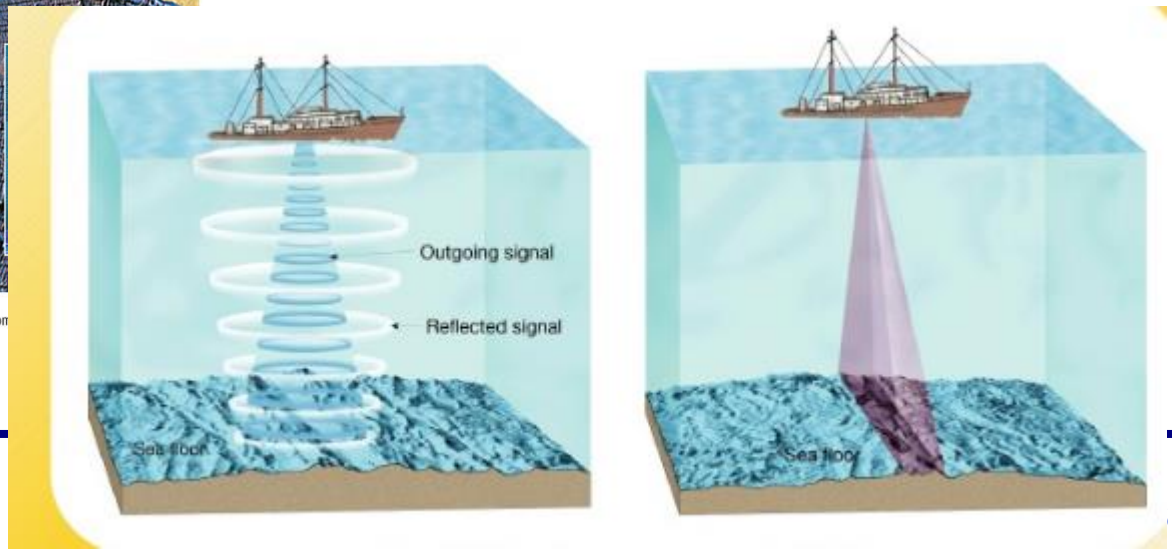
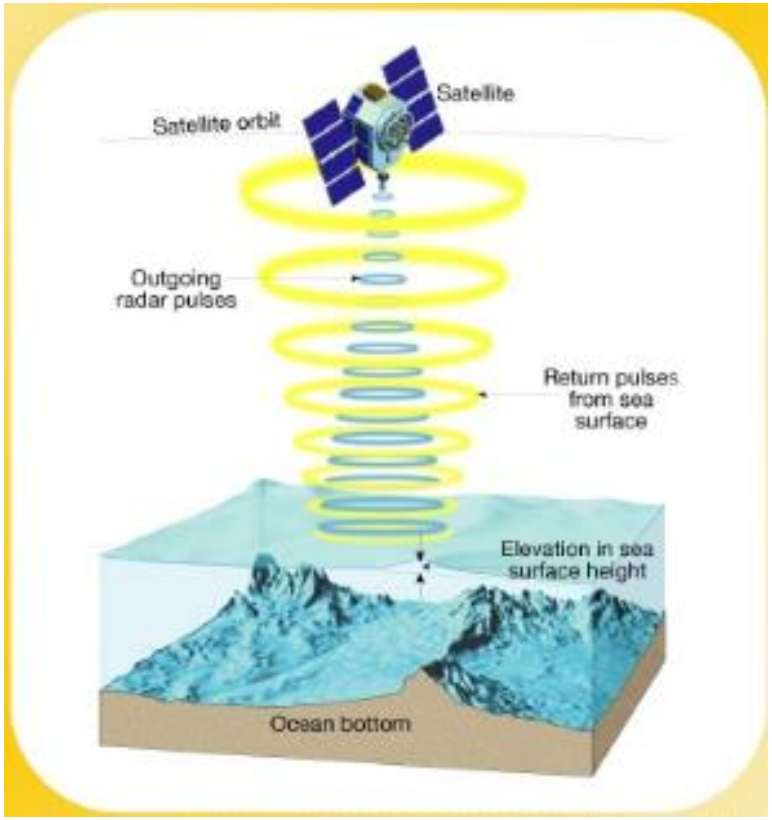
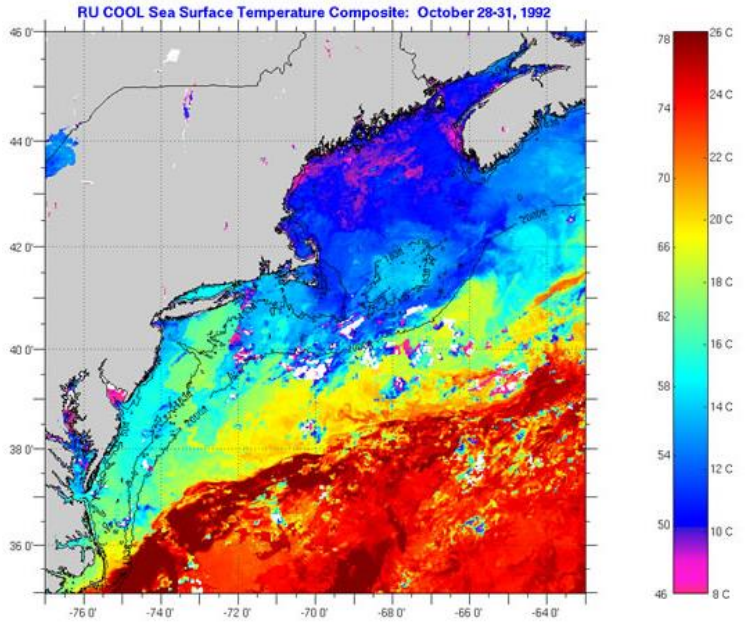


Figure 11.3 By measuring the reflection (echo) of sound waves bouncing back from the ocean bottom mountains, valleys, and canyons on the ocean floor.



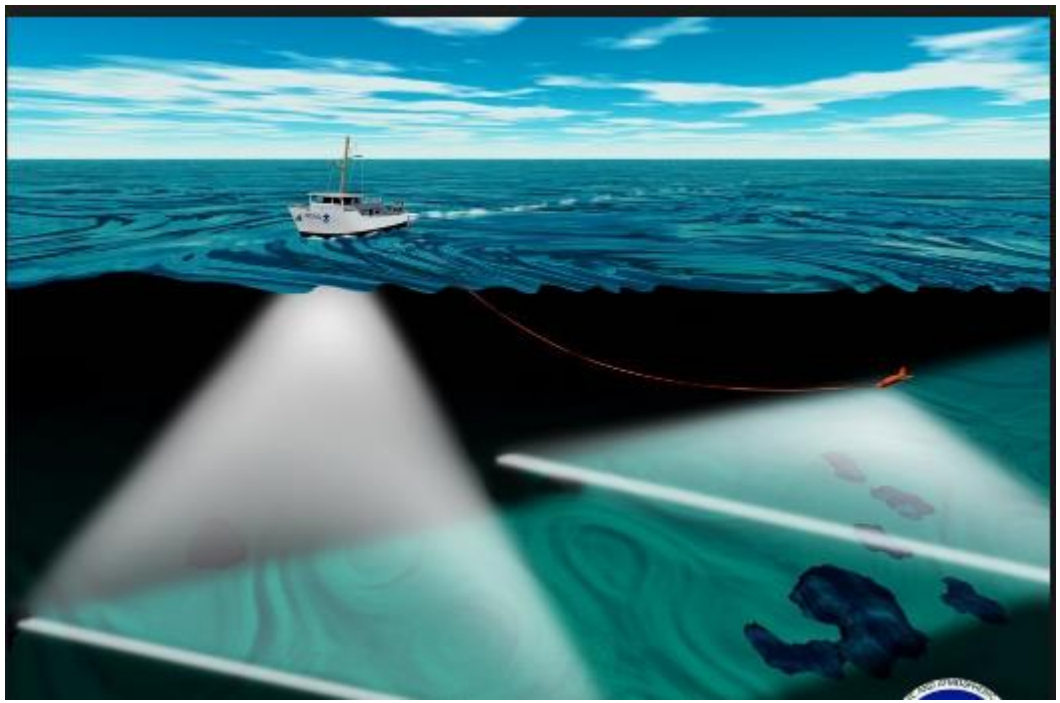
2. Satellites : Space Craft that orbit far above the earth and use technologies to record its features.





An advantage of satellites over ships is that satellites can survey very large areas of the ocean in very short time. Satellites can also record and transmit data in all kinds of weather, and in both day and night.

3. Underwater photography/ videography : Cameras towed from ships can take thousands of high resolution photographs a day. New deep sea cameras and video allow pictures and video to be taken 6000m beneath the surface

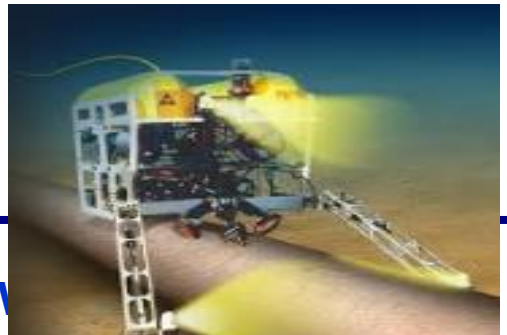


4. Sea submersibles: Small but extremely strong vehicles that are capable of travelling to great depths.

There are two types of submersible

i. Manned Submersibles : Carry people inside and allow them to make their own observations of the deep sea.

ii) Remotely Operated Vehicles (ROV's): allow people to control the vehicle from a ship that is safely on the surface. They can stay down longer than a manned submersible and continuously send data back to the ship.



Refer to pages 46 - 49

4. Underwater photography/ videography

5. Deep sea submersibles

6. Diving

Refer to pages 46 - 49

CORE STSE

“UNDERSEA ADVENTURE”

Technologies: Past & Present

Diving

Submersibles

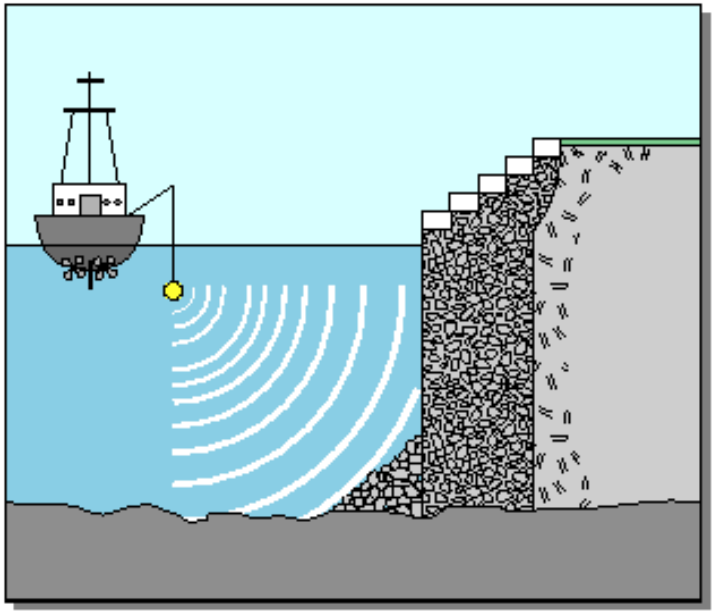
Underwater explorations

- Shipwrecks

Ex. *The Titanic* Discovered in 1985

Wire line depth probe

Sonar



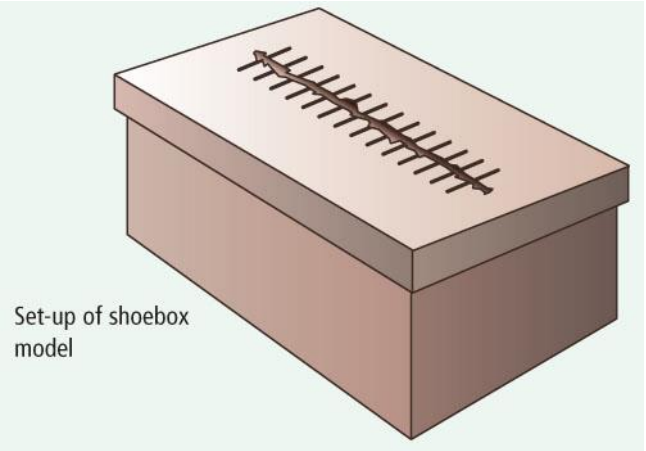
Canadian Organizations involved in Ocean Research

1. Environment Canada
2. Federal Fisheries
3. Ocean Science Centre
4. Centre for Cold Ocean Research (C-CORE at MUN)

Student Activity

- Page 50

"GETTING TO KNOW THE OCEAN FLOOR"

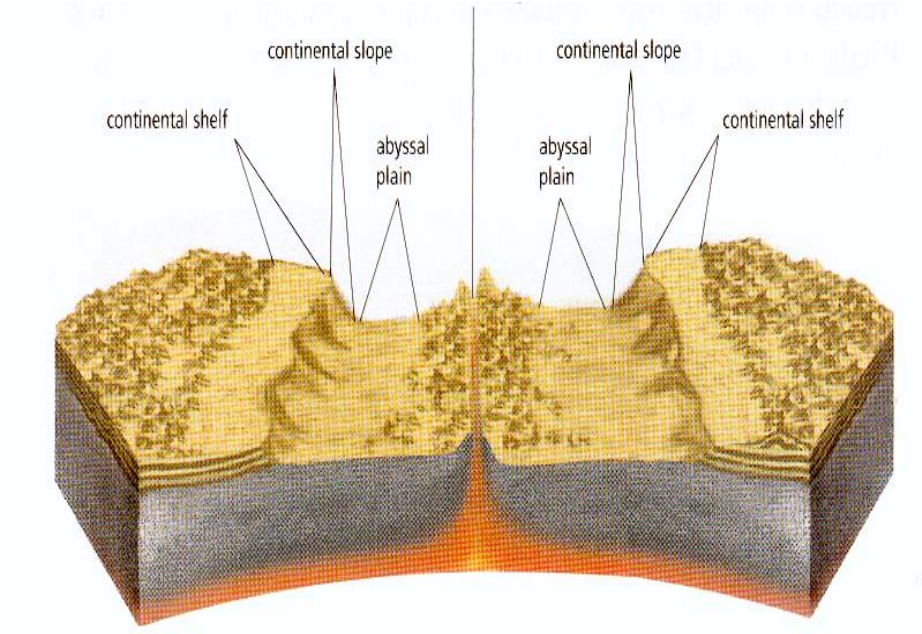


Set-up of shoebox model

The Ocean Floor

- You may be surprised to find many of the features found on land located on the ocean floor. (Mountain ranges, valleys and vast plains)

These features was formed due to movement of the earth's crust through the tectonic plates.



ocean ridges the undersea mountain chains that are formed when magma oozes up and solidifies between tectonic plates that are moving apart

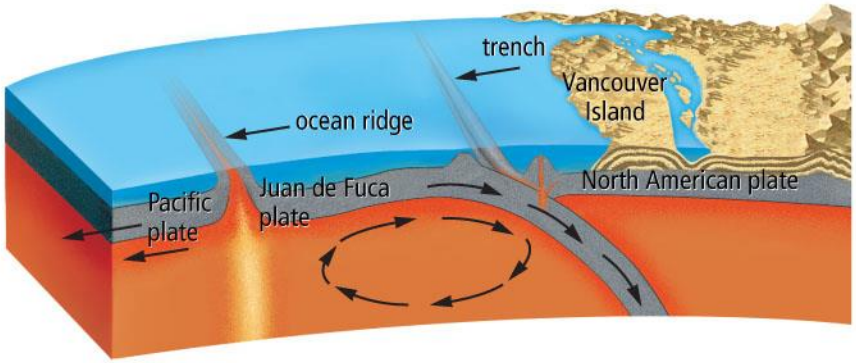
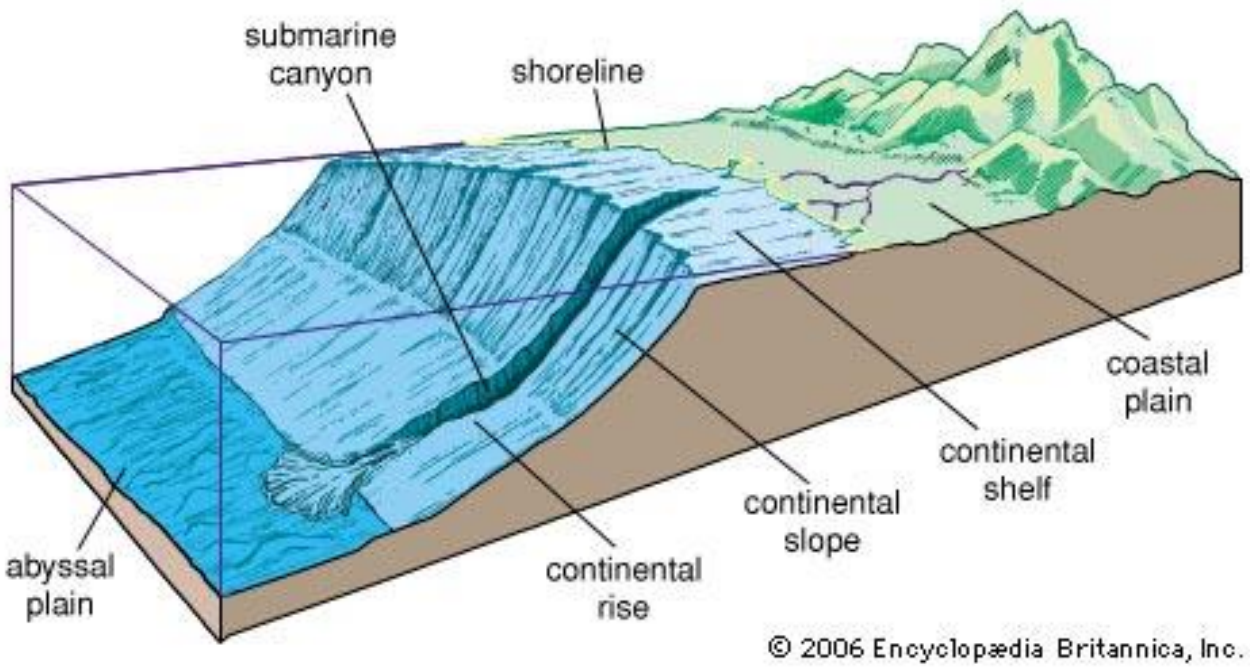


Figure 11.5 When tectonic plates collide, subduction occurs and an ocean trench forms.

trench the deep area that is formed when an ocean plate collides with a continental plate and is forced to bend steeply down beneath the continental plate

Continental Margin

Continental margins refers to the area between the basin and the coastline. The area of the ocean floor that lie underwater along the edge of the continent.



These margins are made of two key components:

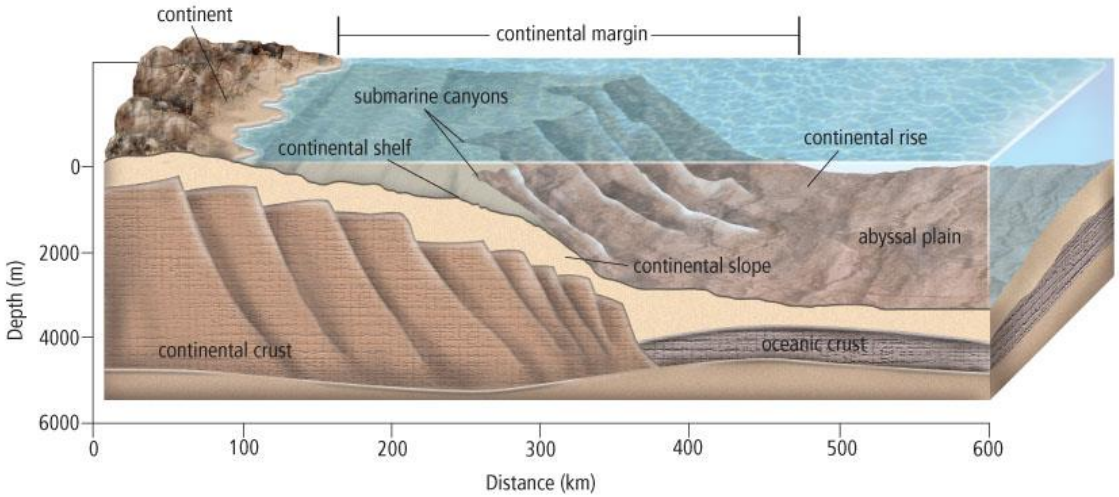


Figure 11.6 Features of the ocean floor at the edge of continents

1)Continental shelf: the submerged part of the continent between the coast and the edge of the basin.

2) Continental slope: continental shelves slope gradually away from the land before dropping drastically.

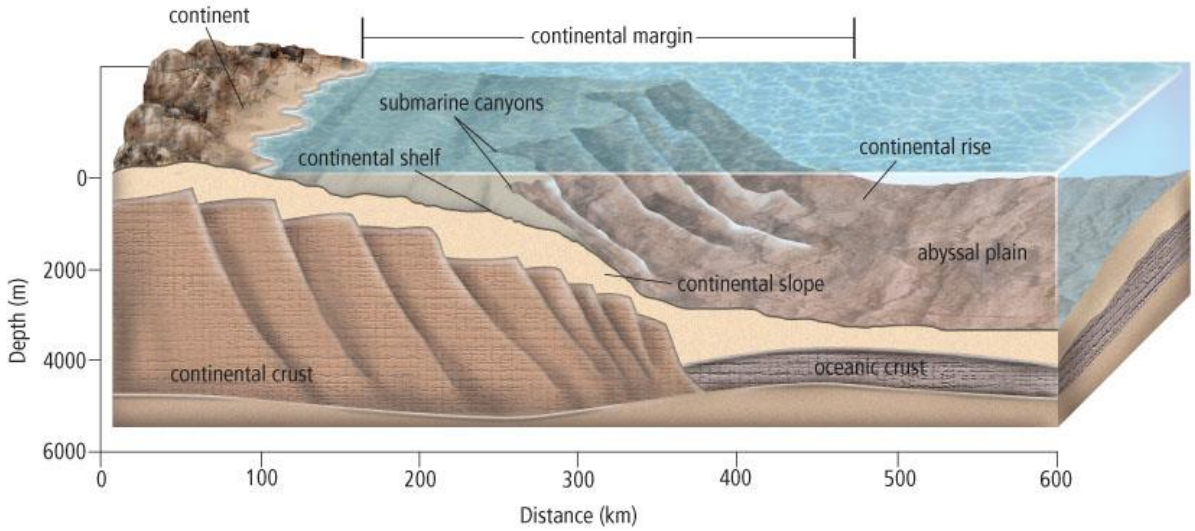


Figure 11.6 Features of the ocean floor at the edge of continents

abyssal plain [a-BIS-uhl] the wide open regions of the ocean floor between the continents and the mountain ranges at the centre of the ocean

Formed of thick deposits of sediments.

Where do these sediments come from?

The sediments come from the continents, brought to the ocean edge by rivers. They reach the sea floor by great underwater landslides

Student Work

- Page 45 #1, #2, #3, #4

- Page 49, #1,

Student Work

- Checking Concept (Page 53)

#1, #2, #3, #4, #5 and #6

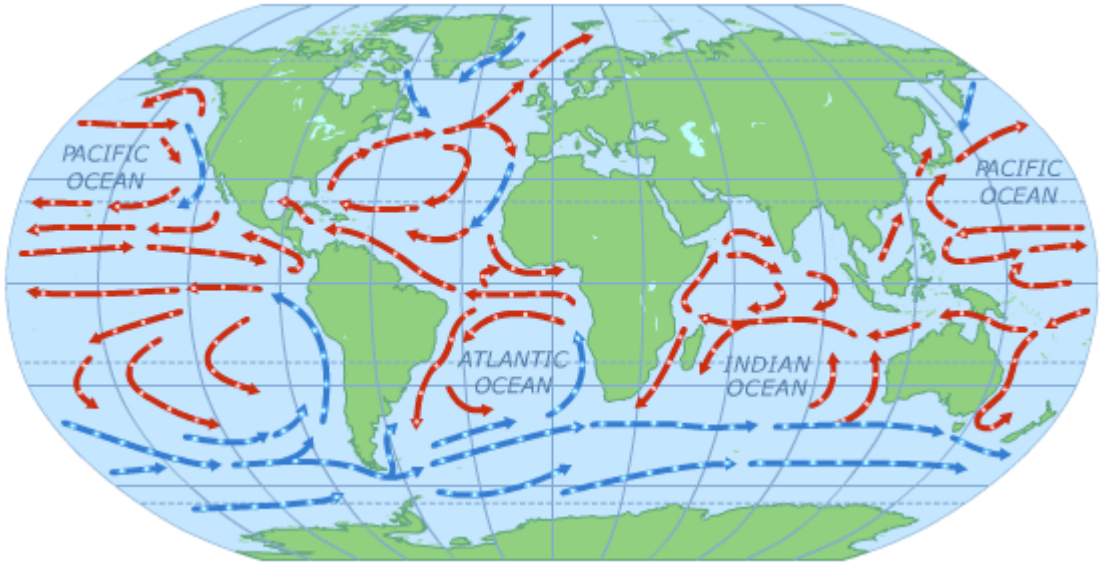
- Understanding Concept

#7, #8, #9 and #10, #11

Science 8

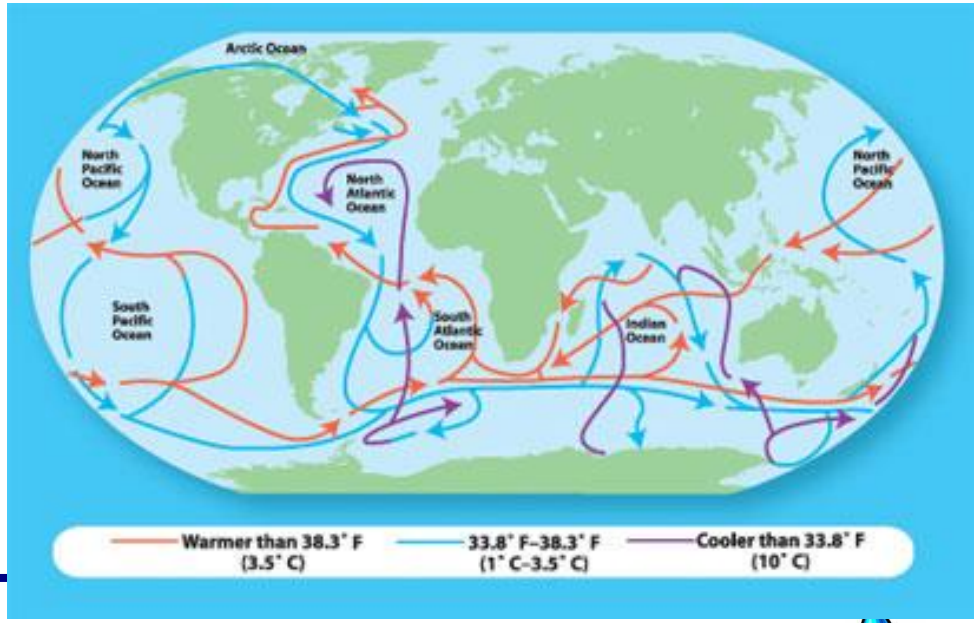
Unit 1:

Topic 7: OCEAN CURRENTS



Ocean Currents...

- Ocean current refers to a large amount of ocean water that moves in a particular and unchanging direction.



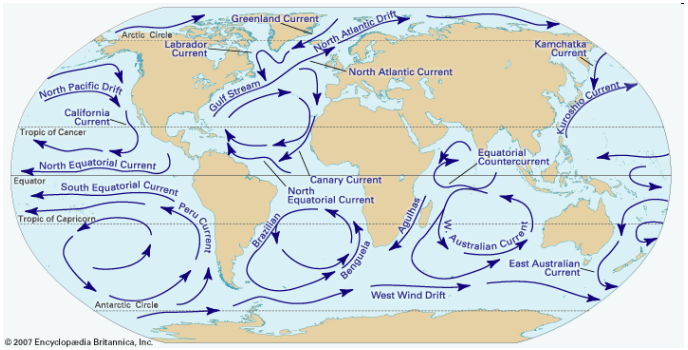
Find out Activity

- Winds and currents page 55

2 Types of Ocean Currents...

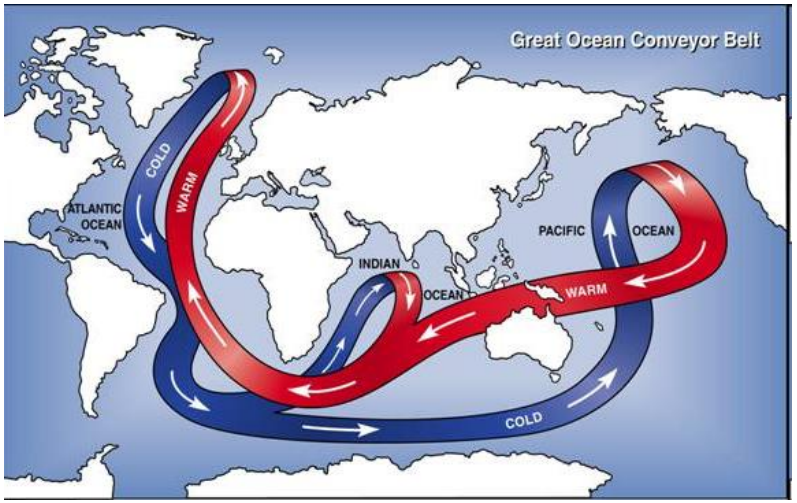
1. Surface currents

- Flow in the top 100-200 m



2. Deep currents

- Flow below 200 m



1) Wind

Factors that influence surface currents are:

- Air movement caused by uneven heating.

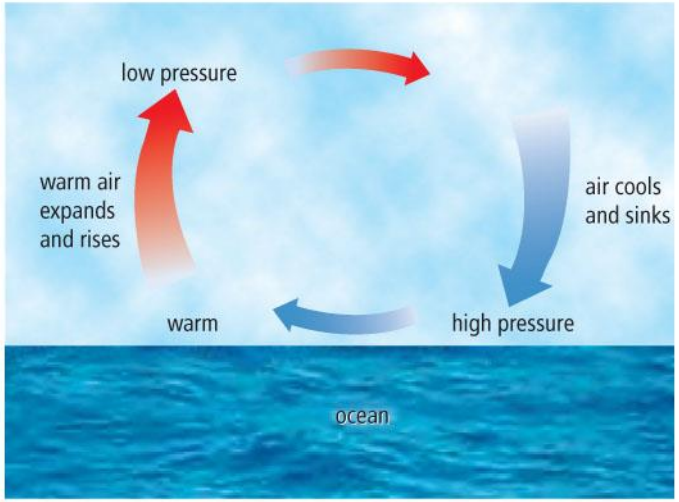


Figure 11.11 The movement of air causes winds.

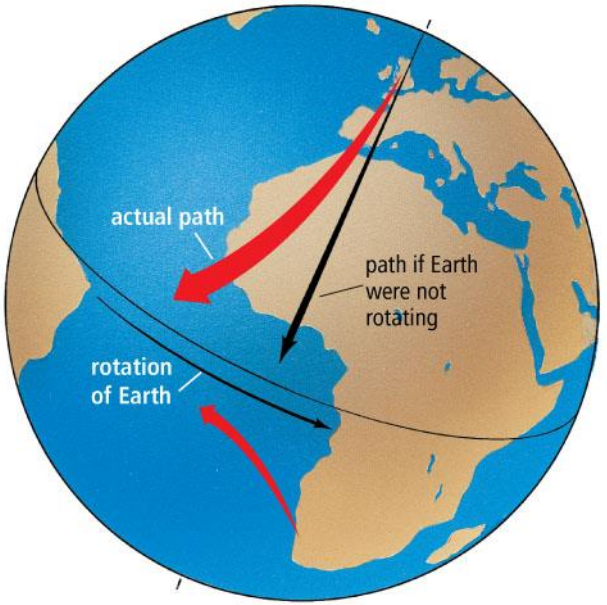
- The energy of the moving air is transferred by friction to the water molecules causing it to move.

2) Earth Rotation

- The Earth spins counter-clockwise.

- This spinning body deflects winds and currents depending on what side the equator they are on.

- This alteration of direction is called the **Coriolis effect**.



Clockwise in the Northern Hemisphere and Counter clockwise in the Southern Hemisphere

3) Shape of Continent

- Moving currents are forced to turn when they meet a solid surface.

Student Work

- Page 58 #1, #2, #3,#4 and #5

Deep Water Currents

The most important influences are:

1. Water temperature

2. Salinity

Demonstration

Fill the glass dish with warm water poured from a glass jug.

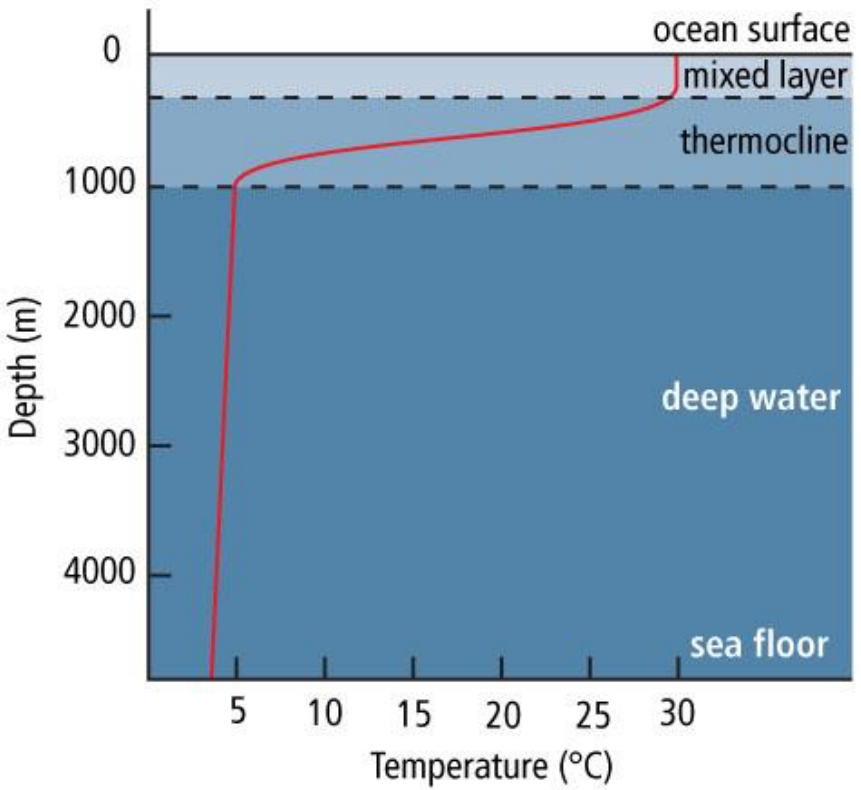
Wrap some ice cubes carefully in aluminium foil, making sure no melted water will be able to leak out. Also on the work surface is the ice cube maker and the square glass dish.

Place a few drops of food colouring over the foil so the colour trickles into the water.

Water Temperature

- Not the same at every depth.

Thermocline part of the ocean below the surface where the temperature drops sharply with depth



**Cold water is also more dense than warmer water.*

Salinity

Density currents are produced by difference in salinity (Amou

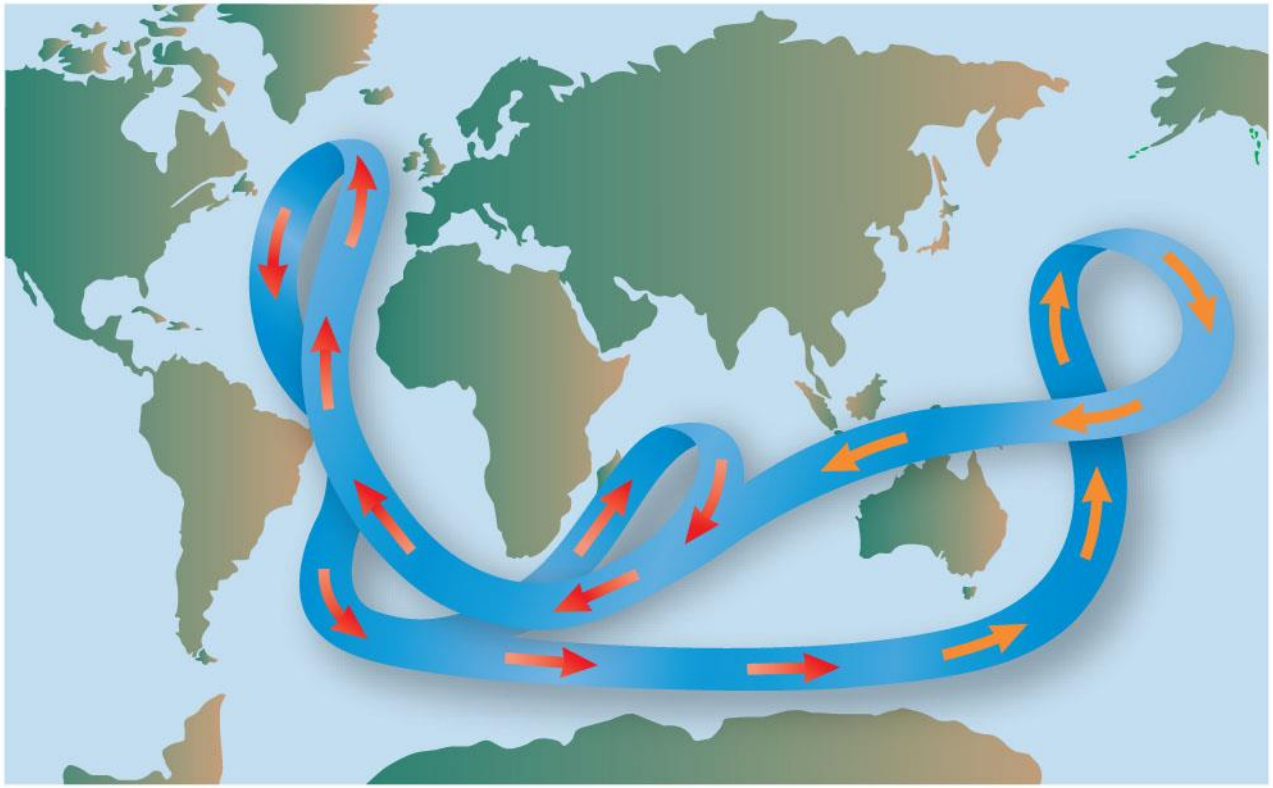


Figure 11.15 The different densities of ocean water in different parts of the world create density currents. These act like giant conveyor belts, moving enormous amounts of water around the globe.

How does the salinity of the ocean water change from one place to another?

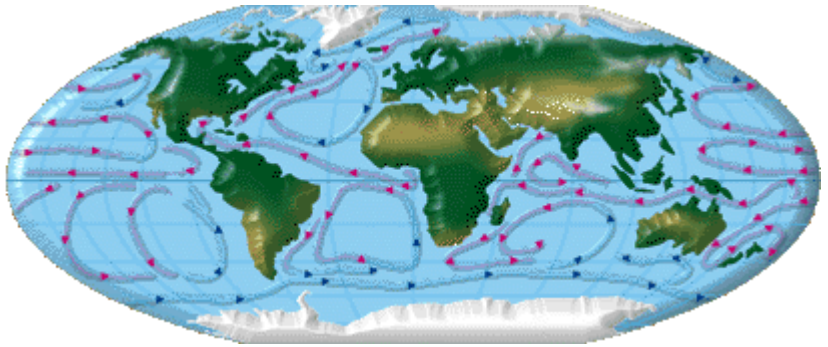
Lower Salinity

- Seawater is less salty at the mouths of large rivers due to the fresh water entering the ocean.

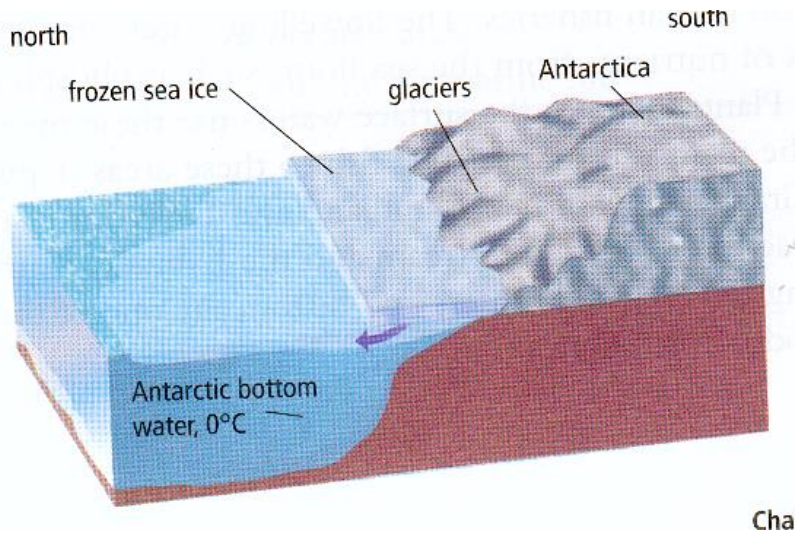
- Fresh water also enters where glaciers and icebergs melt and areas of high precipitation.

Increase Salinity

- High amounts of evaporation increases salinity as well as freezing.



Density currents are formed by sinking, dense water that flows along the ocean floor.



Upwelling

- **Upwelling** vertical movement of water from the ocean floor, often caused by wind blowing surface water away from a shore

Flow in opposite directions of density currents

Upwelling takes place on the Grand Banks due to the Labrador Current and the Gulf Stream. Produce nutrient water for fish

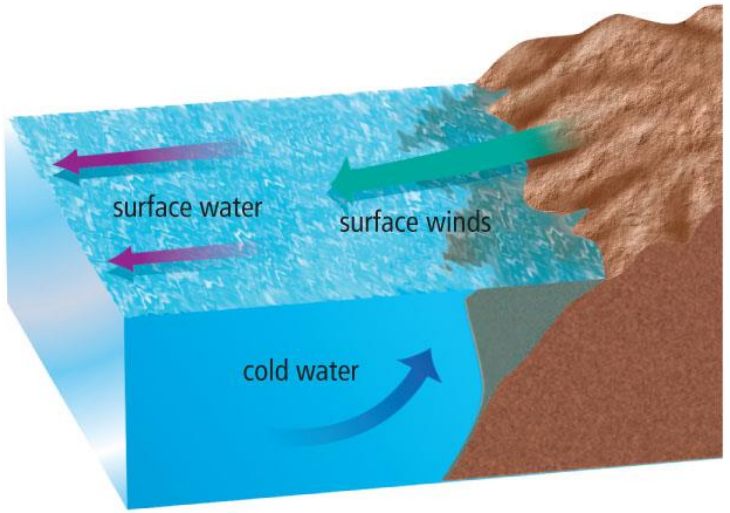


Figure 11.16 Surface winds can cause upwelling by pushing warmer surface waters away from the coast.

Reading Check

- Page 61

- #1,
- #2, (see page 59)
- #3
- #4
- #5 (see bottom page 60)

Checking Concepts

- Page 63

#1, #2, #3, #4, #7, #8, 9

Science 8

Unit 1:

Topic 8: Waves

Waves...

- Large ripples set in motion by steady winds.

- Waves on the surface of water are the result of a transfer of energy from moving air to the water.

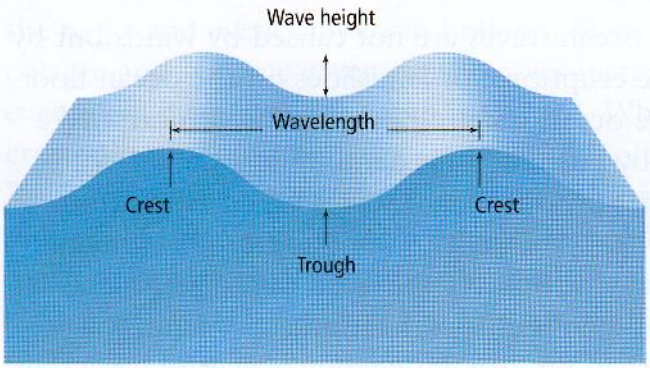
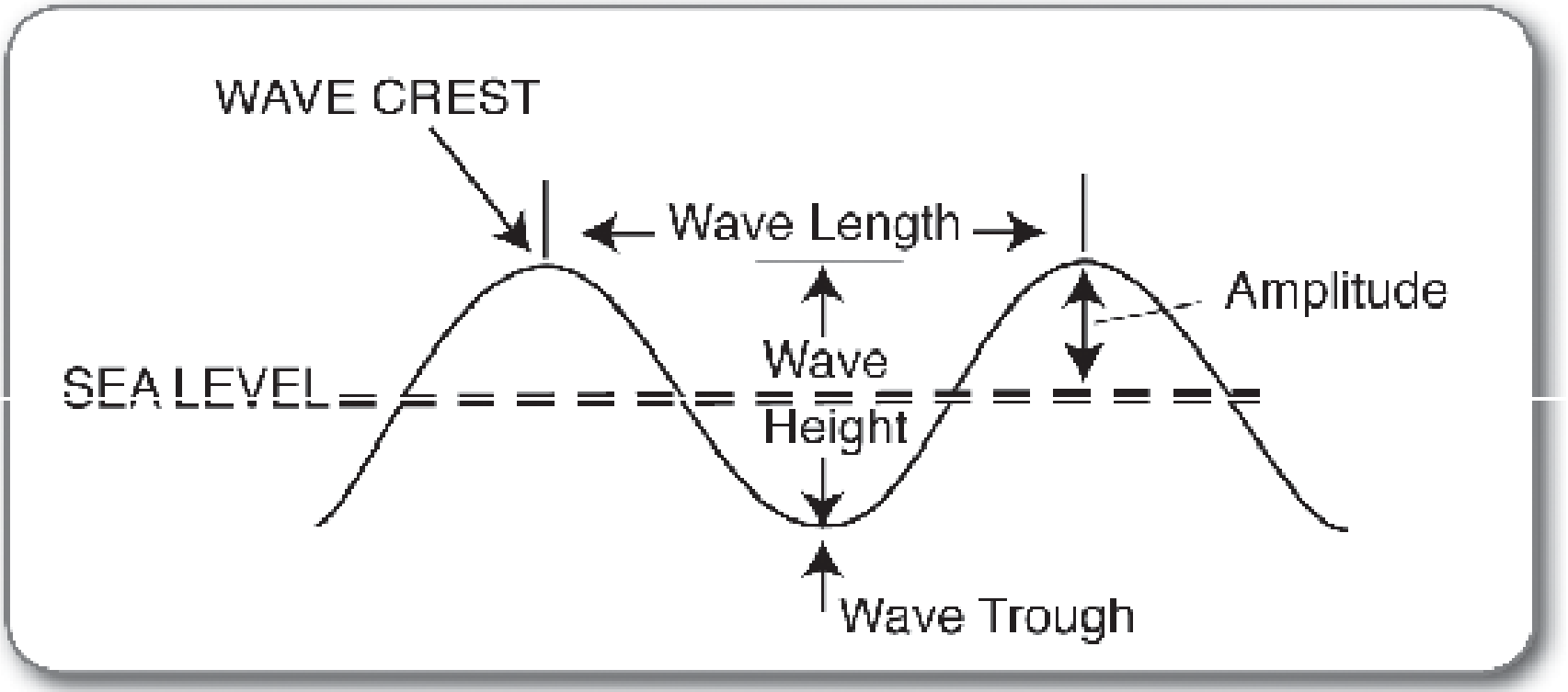
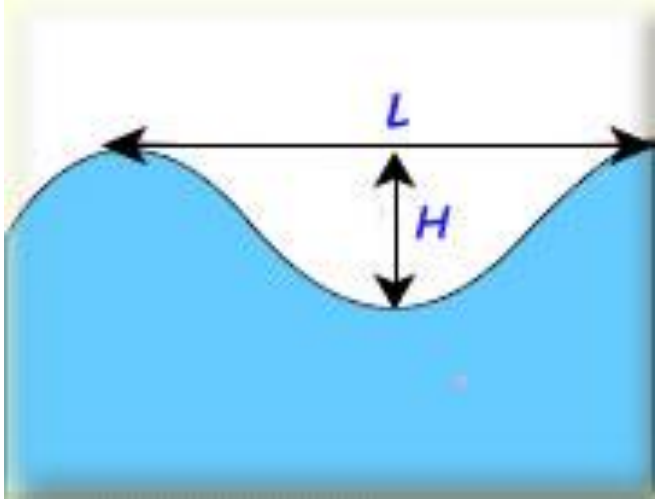


Figure 2.21 Features of a wave

Common Wave Features:



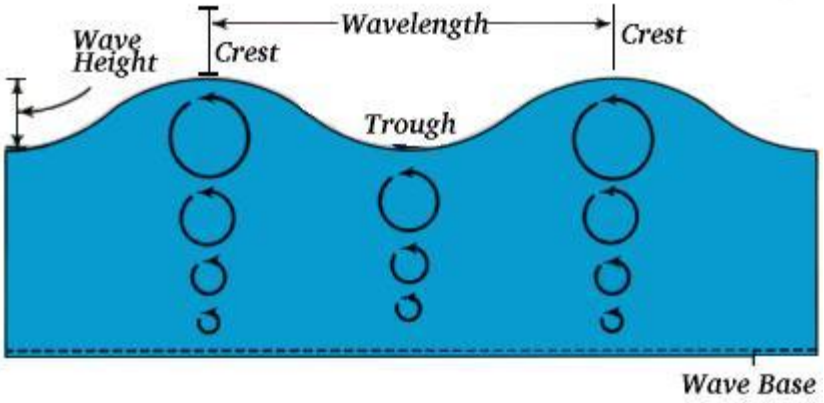
**As a wave approaches a shoreline, the wavelength decreases and the wave height increases.*

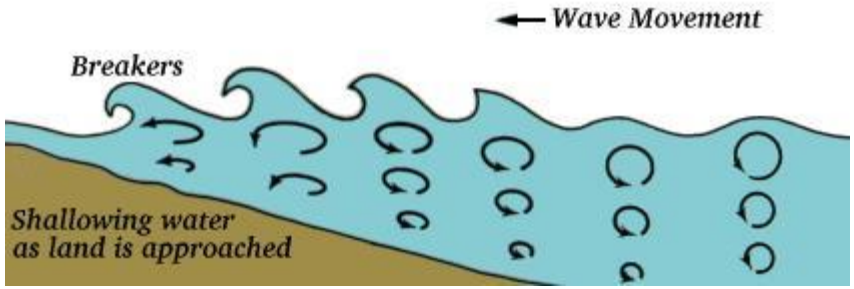


Wave height- is a measured from its crest (highest point) to its trough (lowest point)

Wavelength is the distance from crest to crest

Wave speed: time required for one wave to pass a given point





Individual particles move in circles as a wave passes through the water.

Normal waves are 2 -5 m

Hurricanes can create waves 30 m high.

2 Types of Waves:

1. Swells

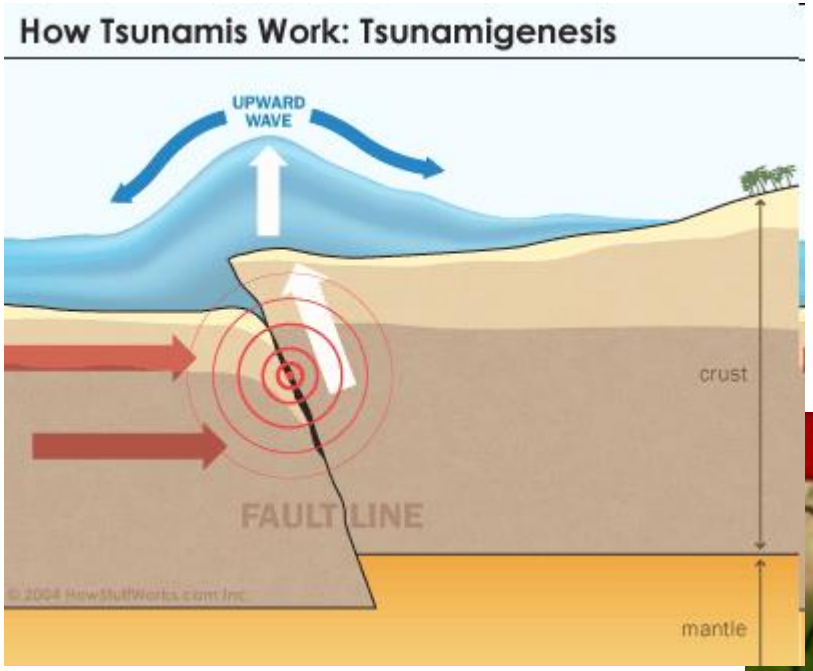
- Smooth waves caused by wind and storms far out in the ocean.

2. Breakers

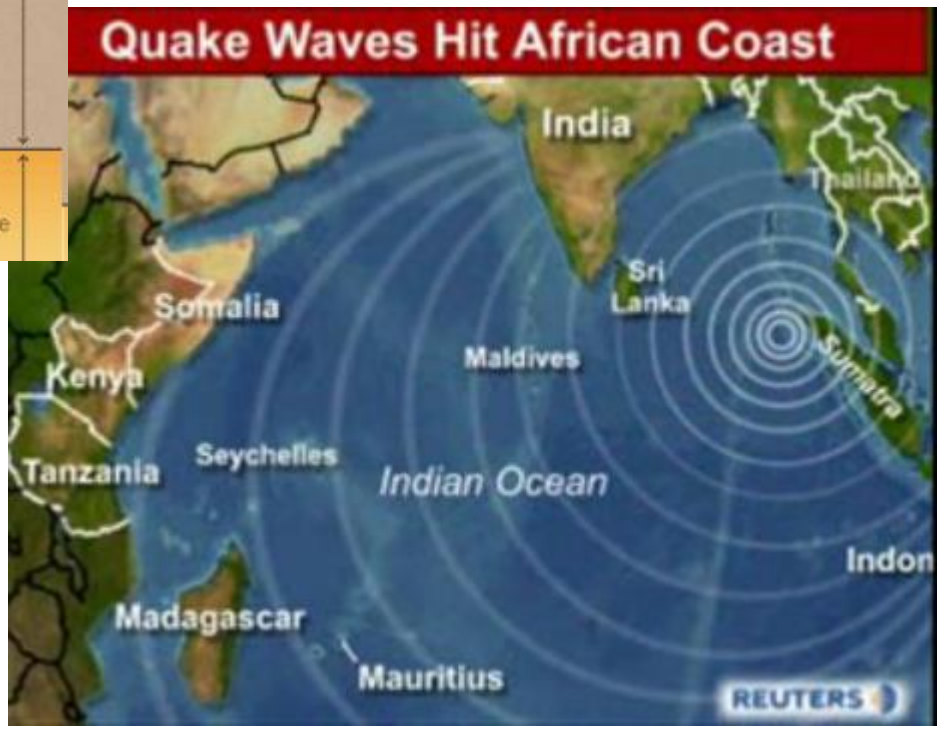
- The tumble of water when a wave collapses onshore.

Tsunamis

- Giant waves that can be sent in motion by earthquakes on the ocean floor, landslides or volcanic eruptions near the shoreline.



The Wavelength = 150 km



Speed = 800 km/ hr

or

222 m/s

- Can be very destructive.

November 18, 1929
South Coast of NL

Reading Check

- Page 69

#1, #2, #3

Science 8

Unit 1:

Topic 9: Tides

Tides...

- The slow rise and fall of the ocean.

- The upper and lower edges of a beach are determin by the high- and low- tide mark.

- Tides are connected to the motion of the moon and the spinning of the Earth.

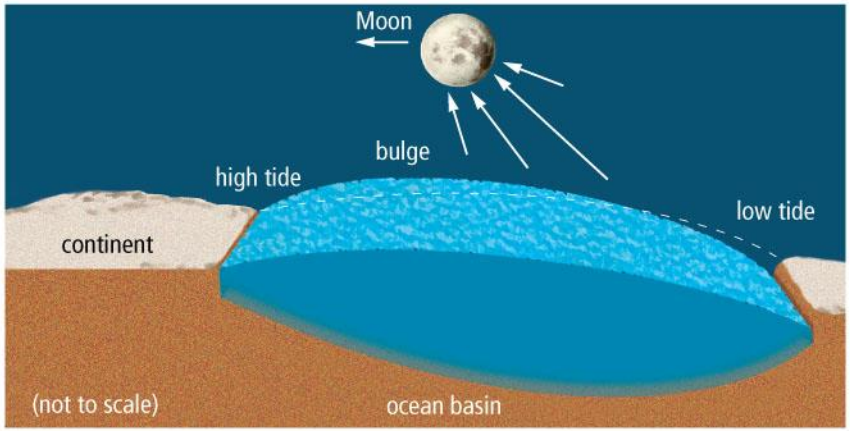
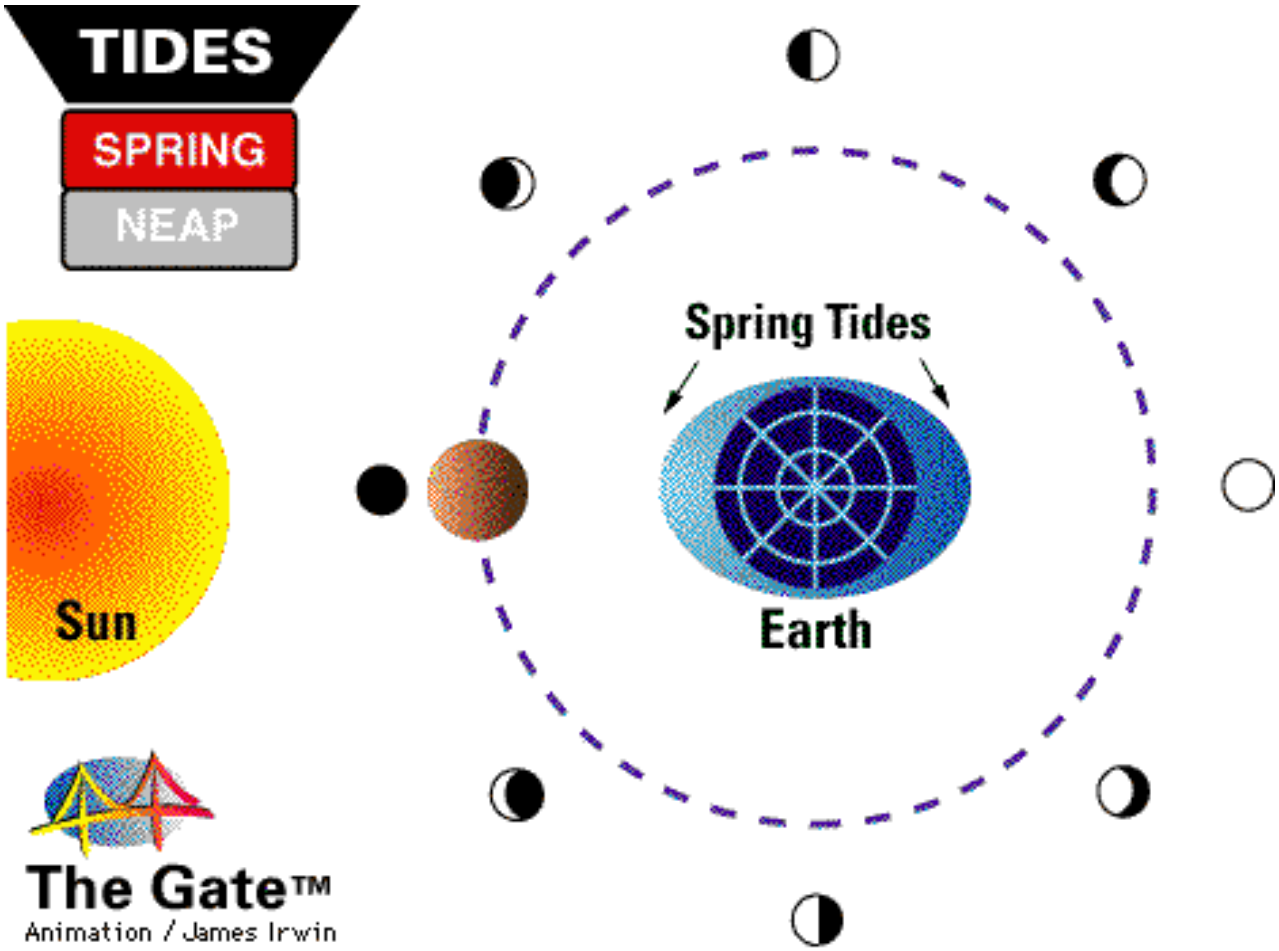
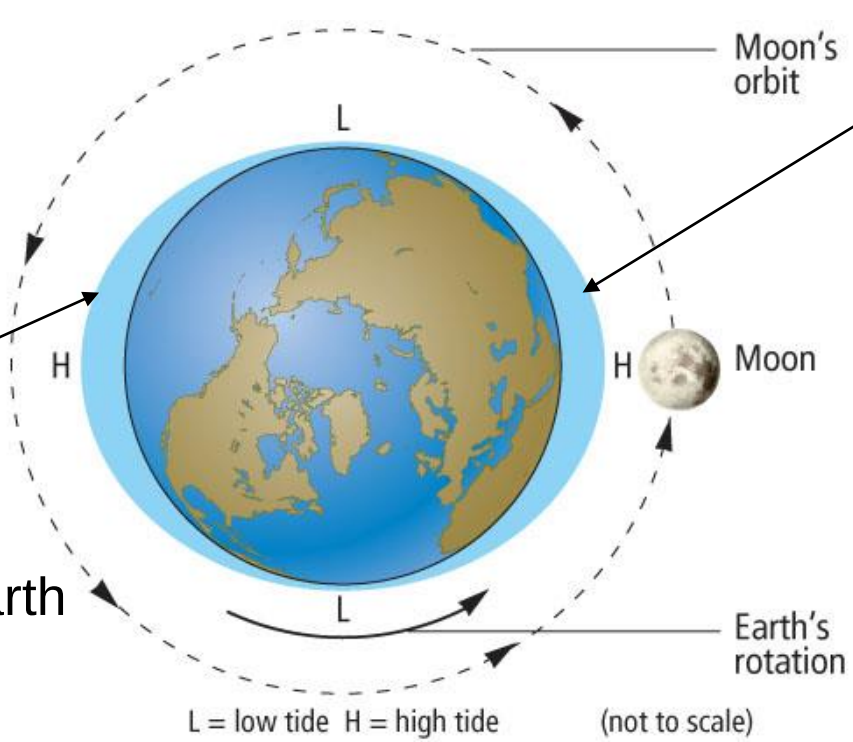


Figure 11.22 The pull of the Moon causes tidal bulges on Earth.

- The moon exerts a greater force of pull than the sun due to its closer proximity to Earth.


TIDES
SPRING
NEAP
Sun
Spring Tides
Earth
The Gate™
Animation / James Irwin

Water Bulges on the side of The earth facing the moon



Water Bulges on the opposite side of the earth facing the moon

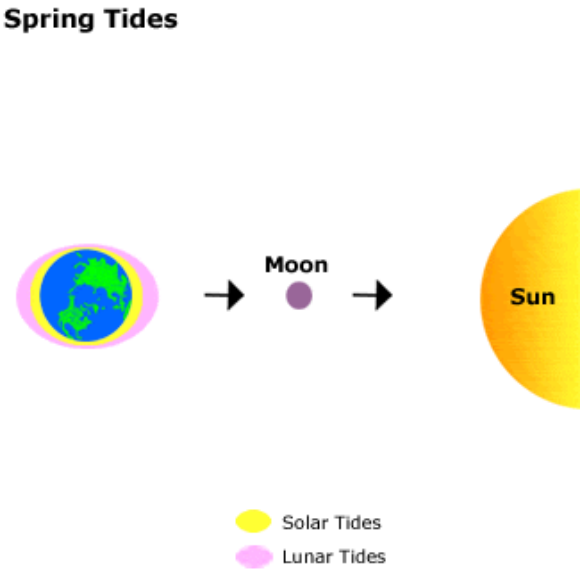
Figure 11.
controls tid

2 Types of Tides:

1. Spring Tide:

- Occur when the Earth, Sun and Moon are in a line.

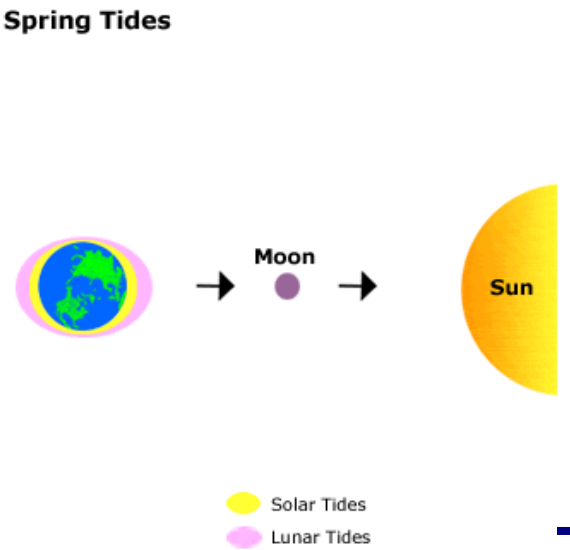
- Causes extra high and low tides.

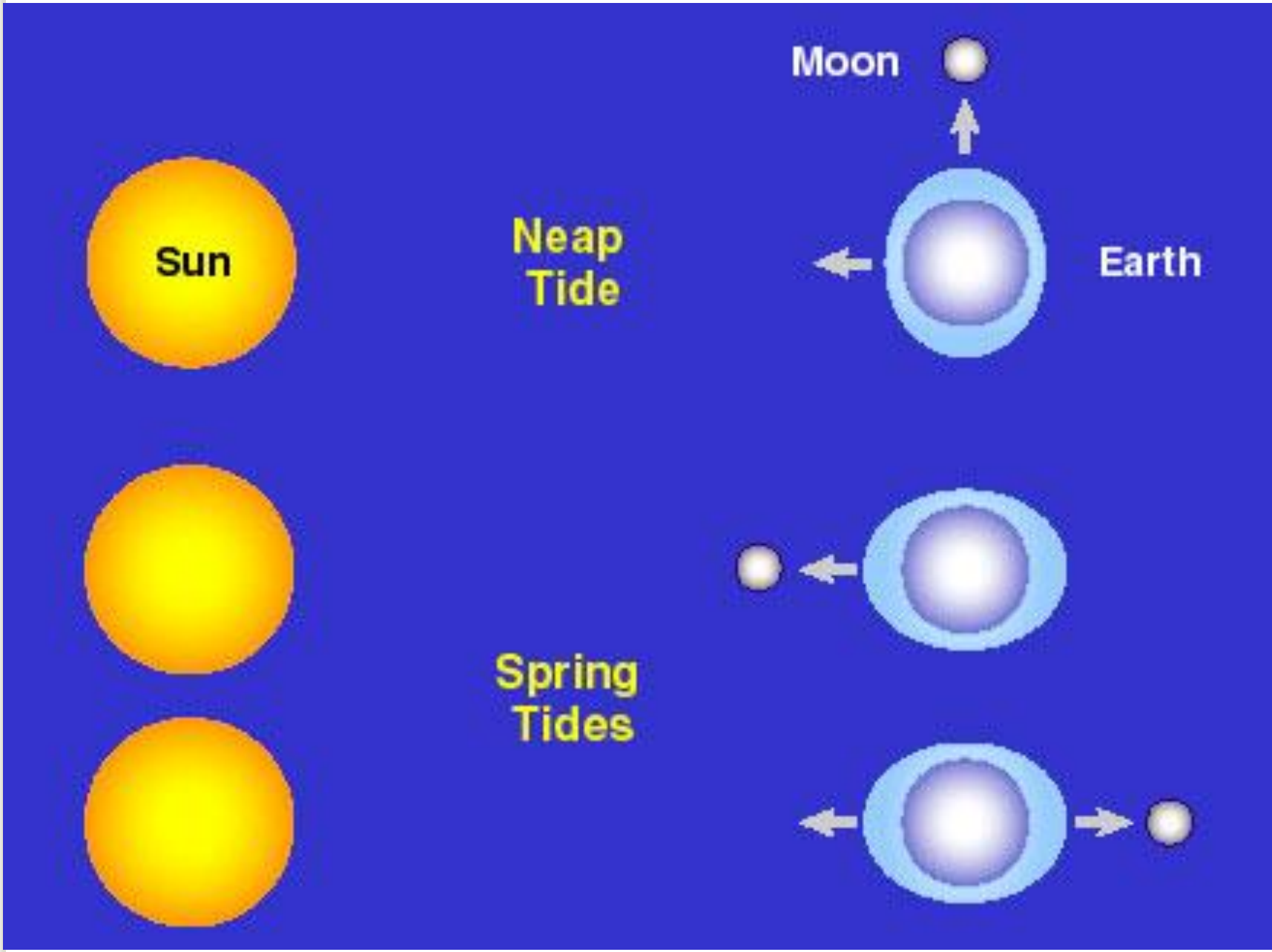


2. Neap Tides:

- Occur when the Sun and the Moon are at right angles to one another.

- Causes the smallest tidal movements. There is little difference between low and high tides.




Moon
Sun
Neap
Tide
Earth
Spring
Tides

Tidal Range:

The difference in level between a high and a low tide.

Notice the large tidal range between low and high - 7 or 8 feet

Bay of Fundy

Bay of Fundy has a large tidal range that is used to generate electricity

Reading Check

- Page 71

#1, #2, #3

Science 8

Unit 1:

Topic 10: Shaping Our Shoreline

Shaping Our Shorelines...

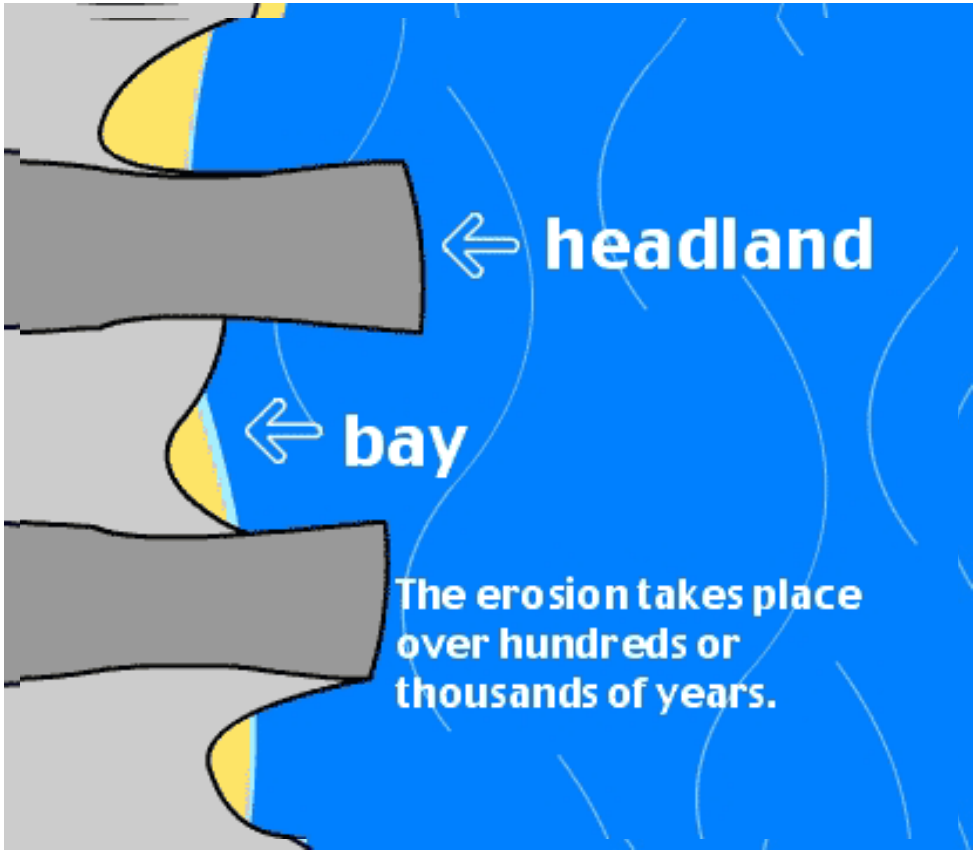
Waves have the power to erode and deposit sediments on the shore.

Tides work with waves to determine the range of shoreline that can be affected by wave action.

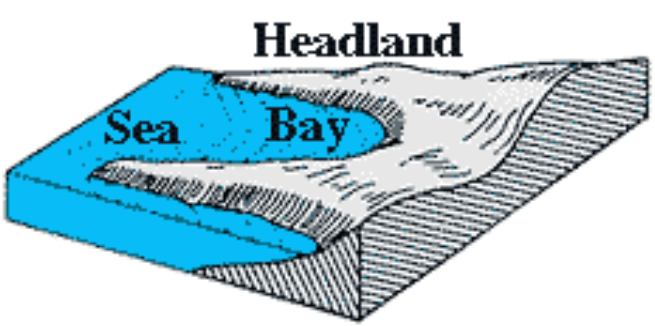
Factors that affect the interaction of waves and tides on the shorelines are:

1. Slope of the shoreline
2. Shape of the shoreline
3. Type of rock material
4. Wave energy

How Bays are Formed



Rate of erosion can differ in areas where the composition of rock differ. Soft Rock (ie, Sedimentary Rock) erodes faster creating bays.

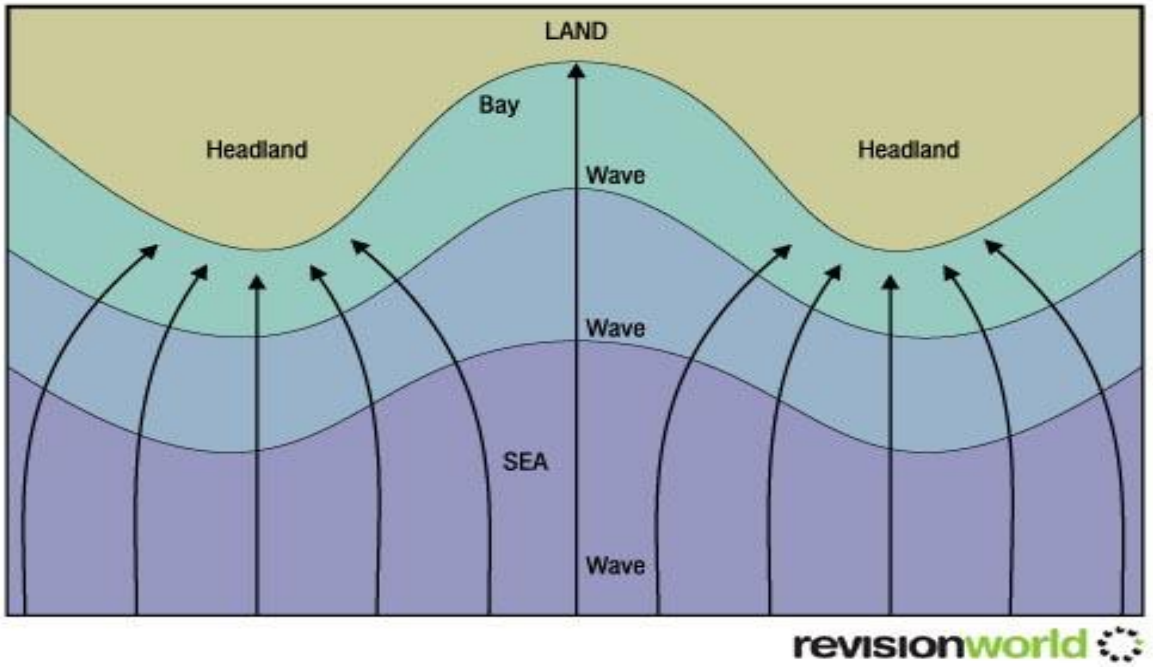


Headlands the parts of the coastline that project farther out into the ocean than the land next to them

Bay an indented areas of coastland or areas in the coastline that are in between headlands

Shoreline Features...

Wave energy is concentrated on headlands and spreads out as it reaches bays.



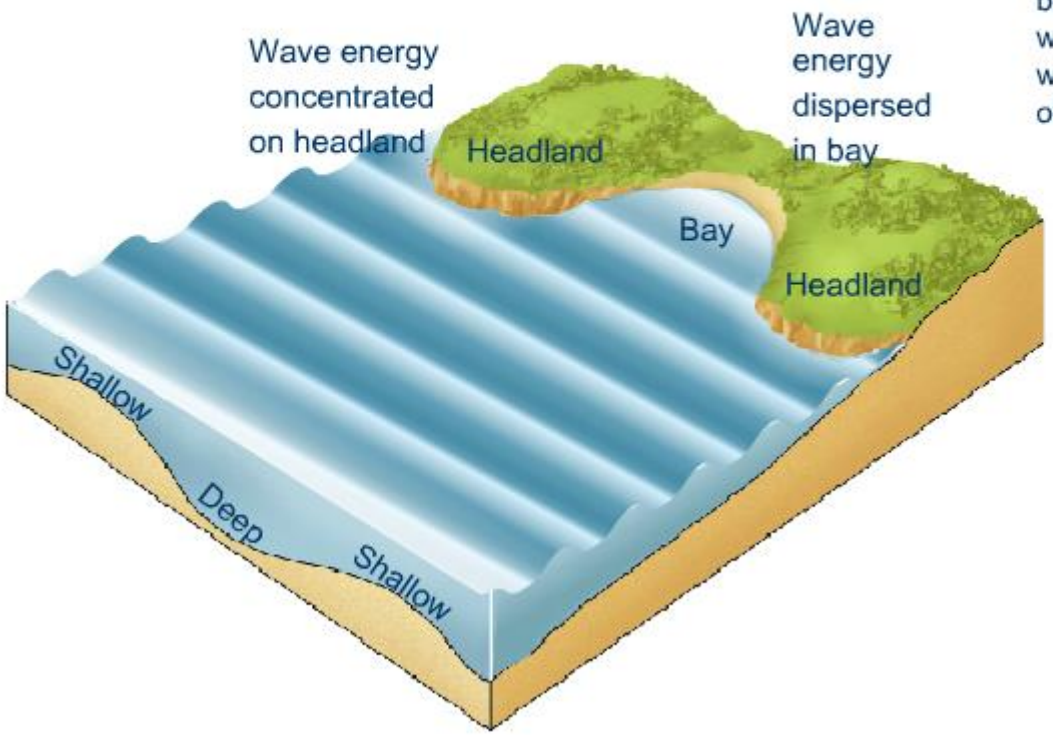
Headland absorb most of the wave energy, the remaining wave refracts and spreads out, losing some of their power to erode.

Parke D. Snavely, Jr., USGS

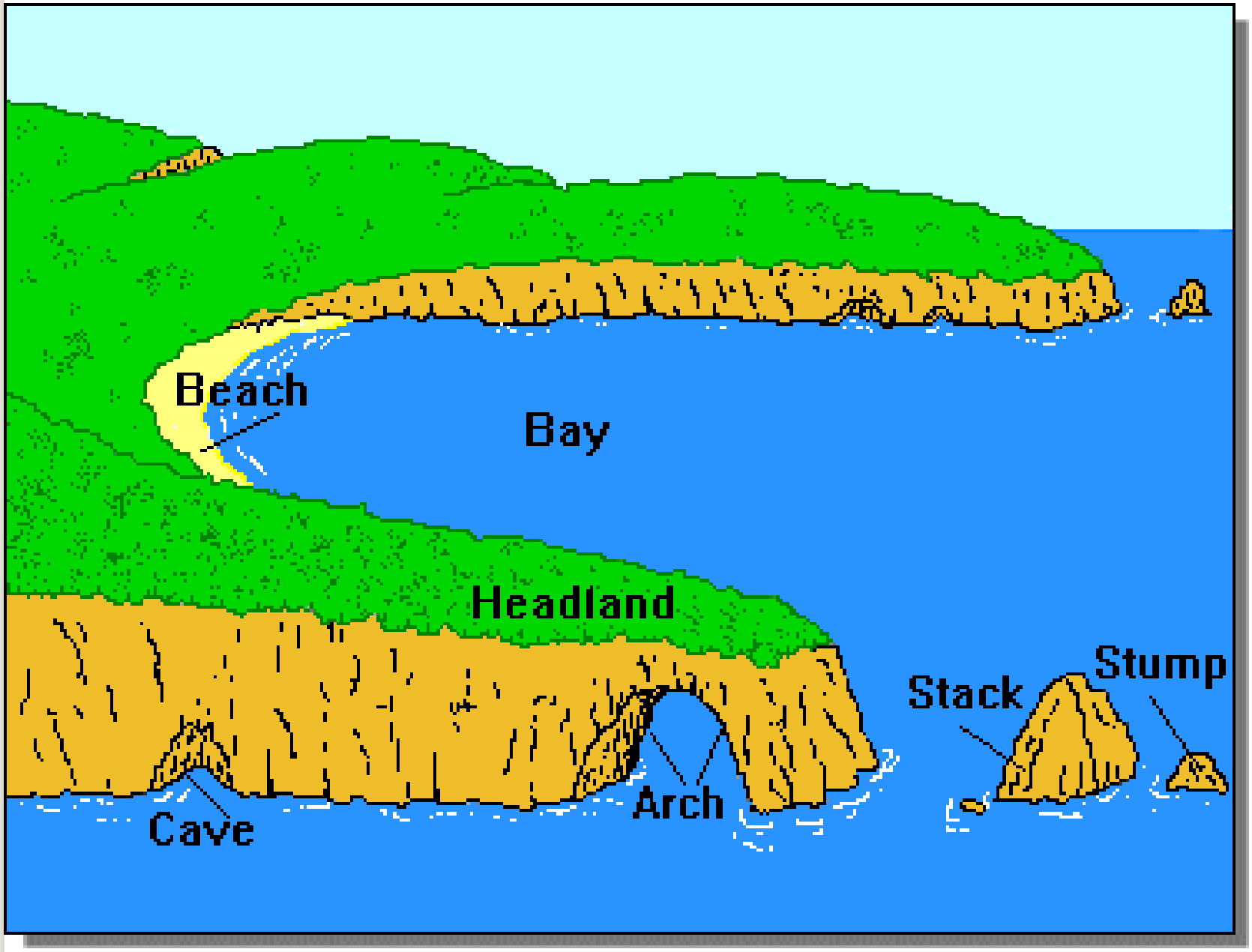
1890

Wave Refraction

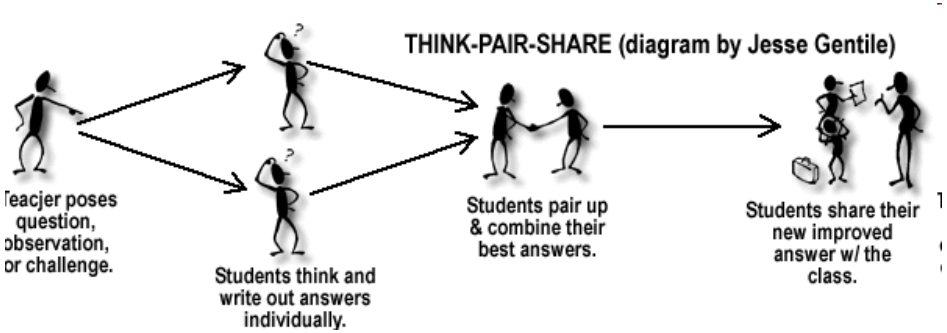
In deep water, away from the coastline, waves arrive undistorted. As the wave begins to arrive at the coastline, the water becomes shallow and so the wave begins to be bent by the process of wave refraction.



Continue


Beach
Bay
Headland
Stump
Stack
Arch
Cave

Think-Pair-Share…



How can coastal communities minimize the damage to shoreline property due to waves and tides?

Shorelines can change quickly

Example...

Intense wave action during:

- winter storms
- hurricanes

Etc.

Technologies to prevent/ reduce the effects of wave action near human development include:

1. Breakwaters
2. Jetties/ wharves
3. Vegetation
4. Sea walls
5. Coastal reconfiguration

Science 8

Unit 1:

Chapter 3

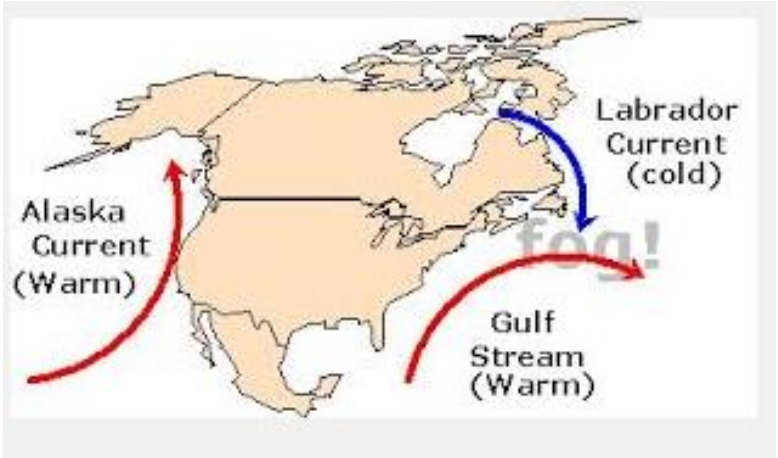
Water Systems on Earth's Surface

Teacher: Mr. Fifield

Science 8

Unit 1:

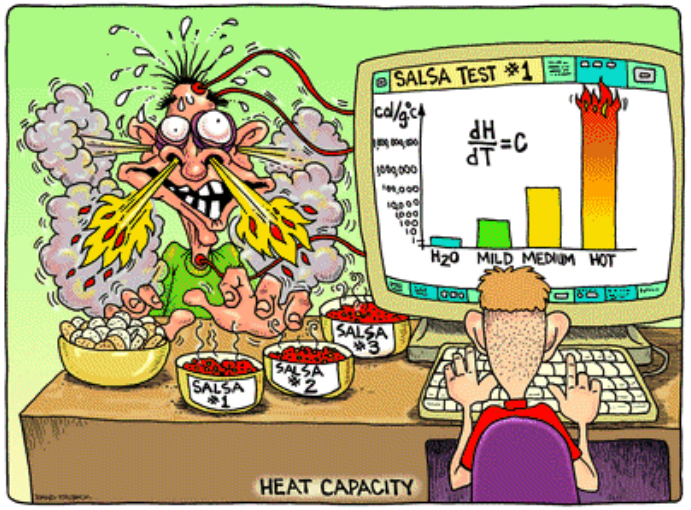
Topic 11: How Oceans Affect Climate



Heat Capacity

- **Heat Capacity:** A measure of how long it takes a material to heat up or cool down.

- Water has a high heat capacity... It takes a long time to heat up and a long time to cool down.



- Oceans can store large amounts of heat. Currents will transfer this heat to other parts of the world.

Heat Capacity ≠ Specific Heat Capacity

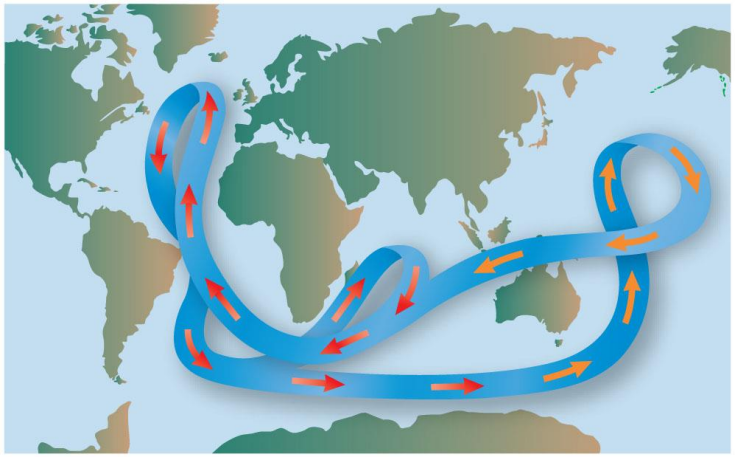
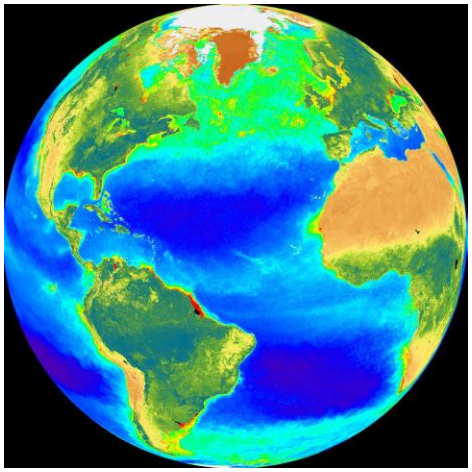


Figure 11.15 The different densities of ocean water in different parts of the world create density currents. These act like giant conveyor belts, moving enormous amounts of water around the globe.



Student Activity

- Leaning How liquids lose Heat

- Page 84

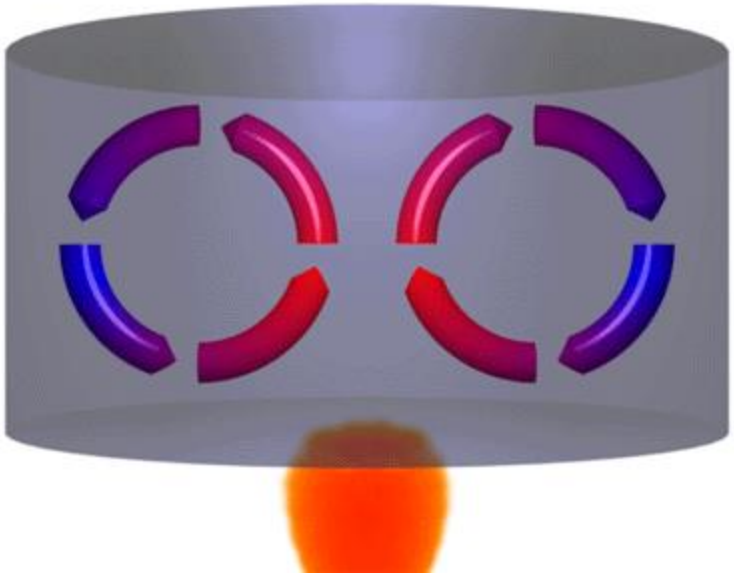
& Weather

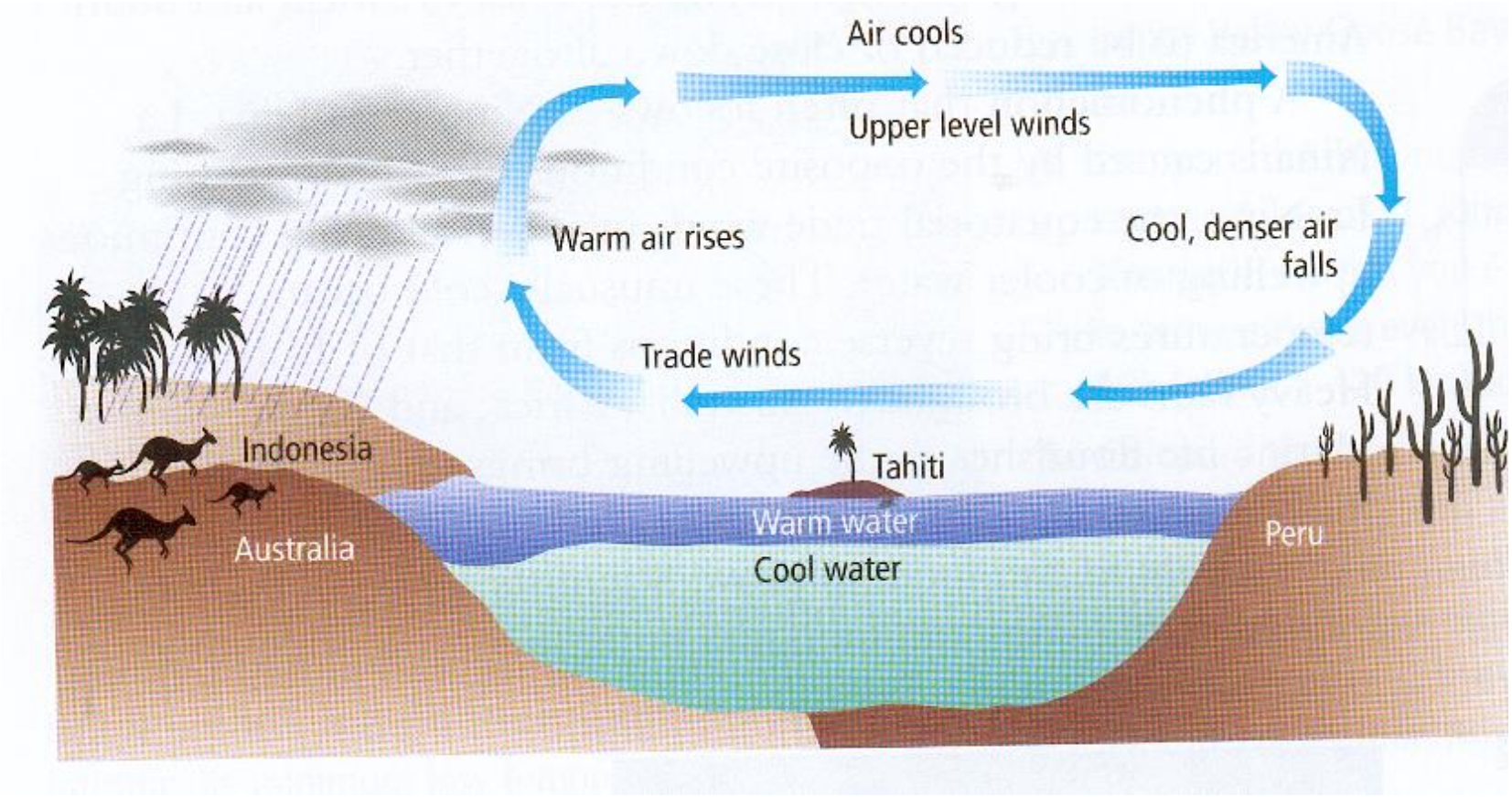
Weather:- is the set of environmental conditions encountered from one day to the next.

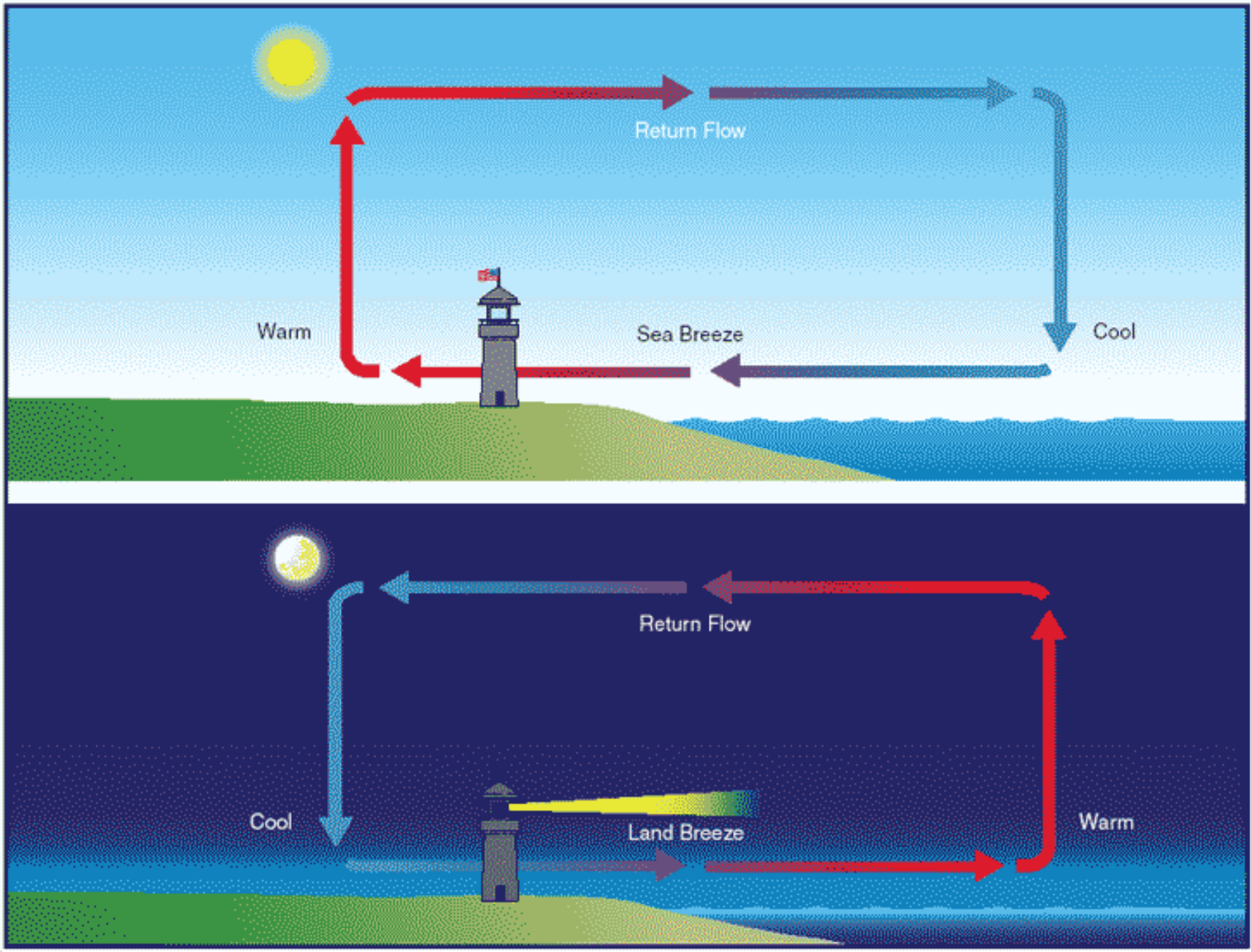
is described in terms of temperature, wind speed and direction, air pressure and moisture.

Convection

Convection: heat transfer resulting from circulation.




Air cools
Upper level winds
Warm air rises
Cool, denser air falls
Trade winds
Indonesia
Australia
Tahiti
Warm water
Cool water
Peru


Return Flow
Warm
Sea Breeze
Cool
Return Flow
Cool
Land Breeze
Warm

Oceans & Climate

Climate: refers to the main characteristics of an area's weather.

- What you would expect to experience in your area at any given season or time of year.

- Ocean temperatures can have an effect on the climates of coastal communities.

Due to its high heat capacity:

- Oceans stay warmer through the fall and into winter than land masses.

- Oceans remain cooler through spring and into summer.

- This keeps the climate of coastal areas from being extremely hot in the summer and extremely cold in the winter.

This is called a Moderate Climate

Student Work

- Page 83 #1, #2, #3, #4

Movie

- **Going With the Flow**

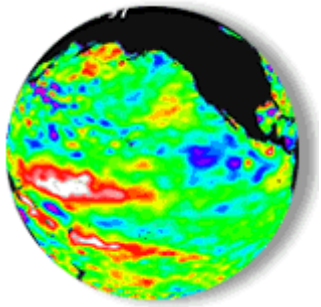
Aliant Resources

Other video

Waves in the Ocean (Junior)

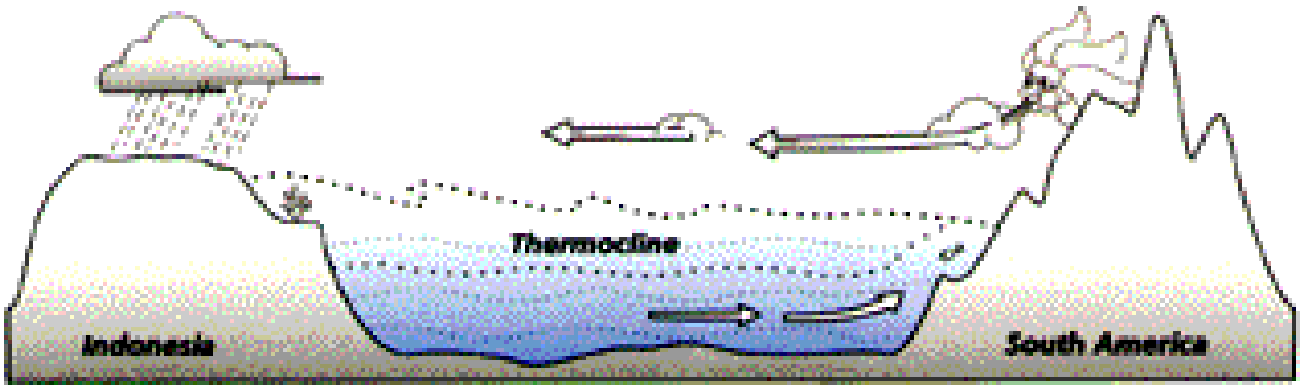
Waves in the Ocean (Senior)

El Niño...

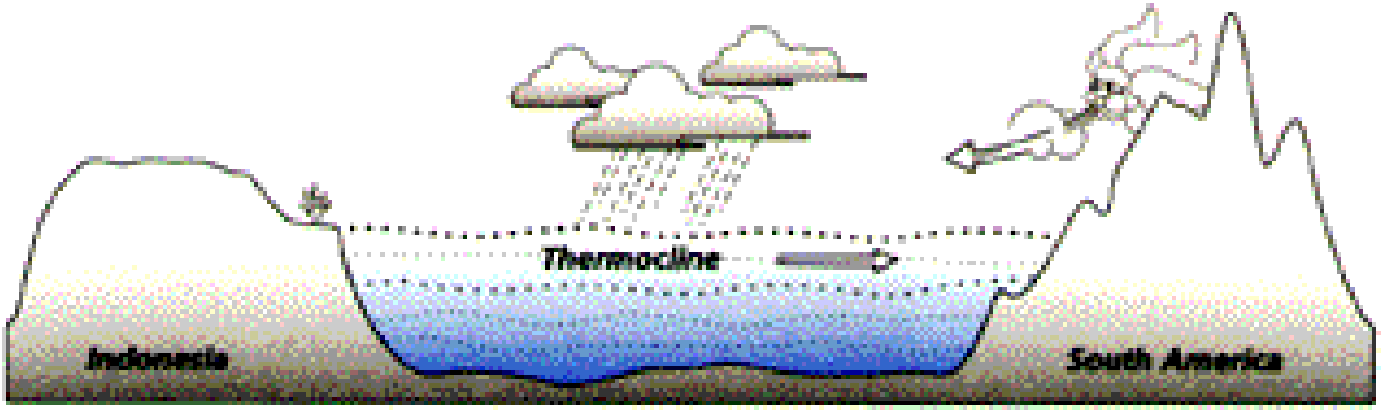


- Spanish for little Boy
- an abnormal warming of surface ocean waters in the eastern tropical Pacific
- Occurs every 3-7 years
- The trade winds do not increase after having been slowed down.
- The waters are warmer than usual.

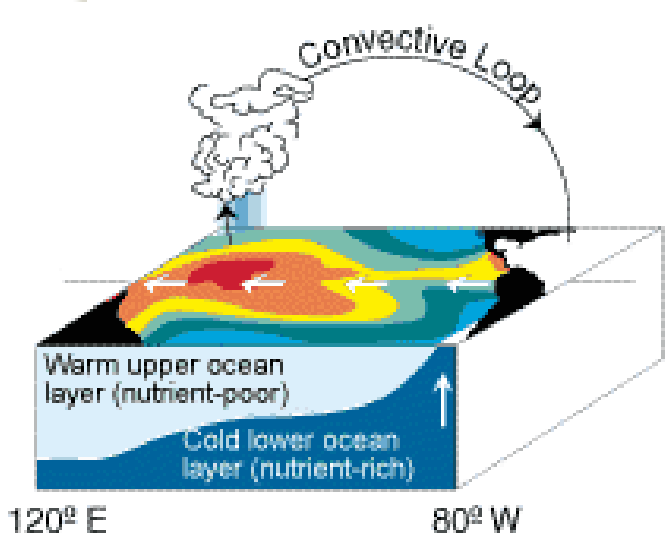
Under Normal Conditions



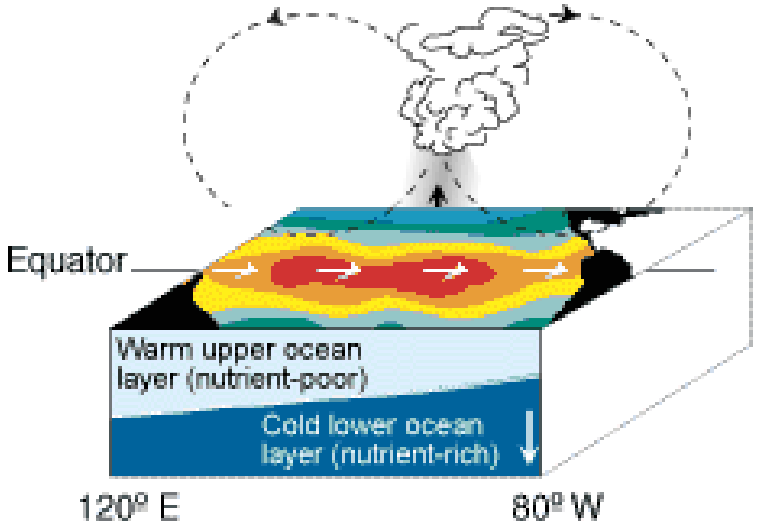
El-Nino Conditions



Under Normal Conditions



El-Nino Conditions

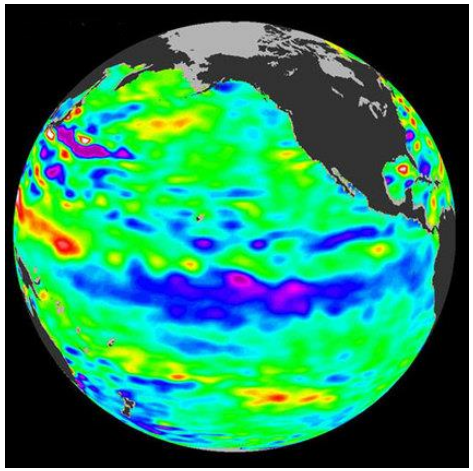


- Is responsible for changing rainfall patterns around the world.

Drought & Fire	Storms & Floods
Australia Africa Central America	Peru Chile North America

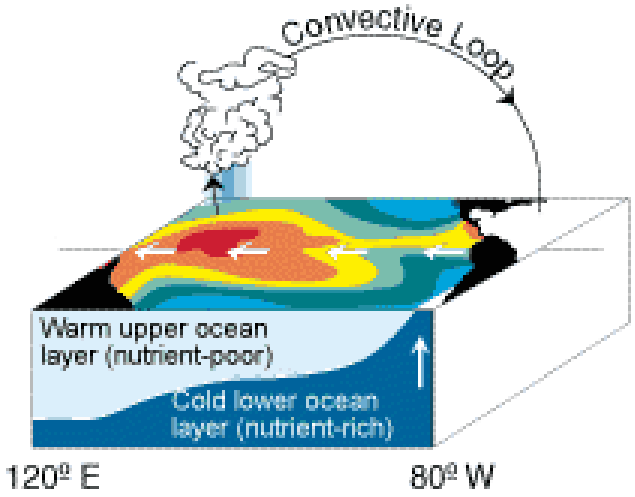
- These warm waters force the smaller ocean organisms (phytoplankton) to move deeper into cooler water. Fish and other animals that eat these organisms must follow.

La Niña...

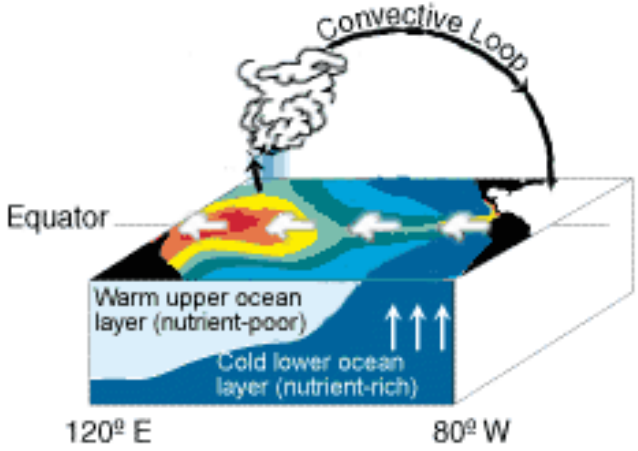


- Spanish for little girl
- Often follows El Niño
- **the appearance of cooler than normal waters in the eastern and central Pacific**
- The equatorial trade winds increase allowing continuous upwelling of cooler water.

Under Normal Conditions



La Niña conditions



- Brings heavy rains to Australia, Africa and South America.

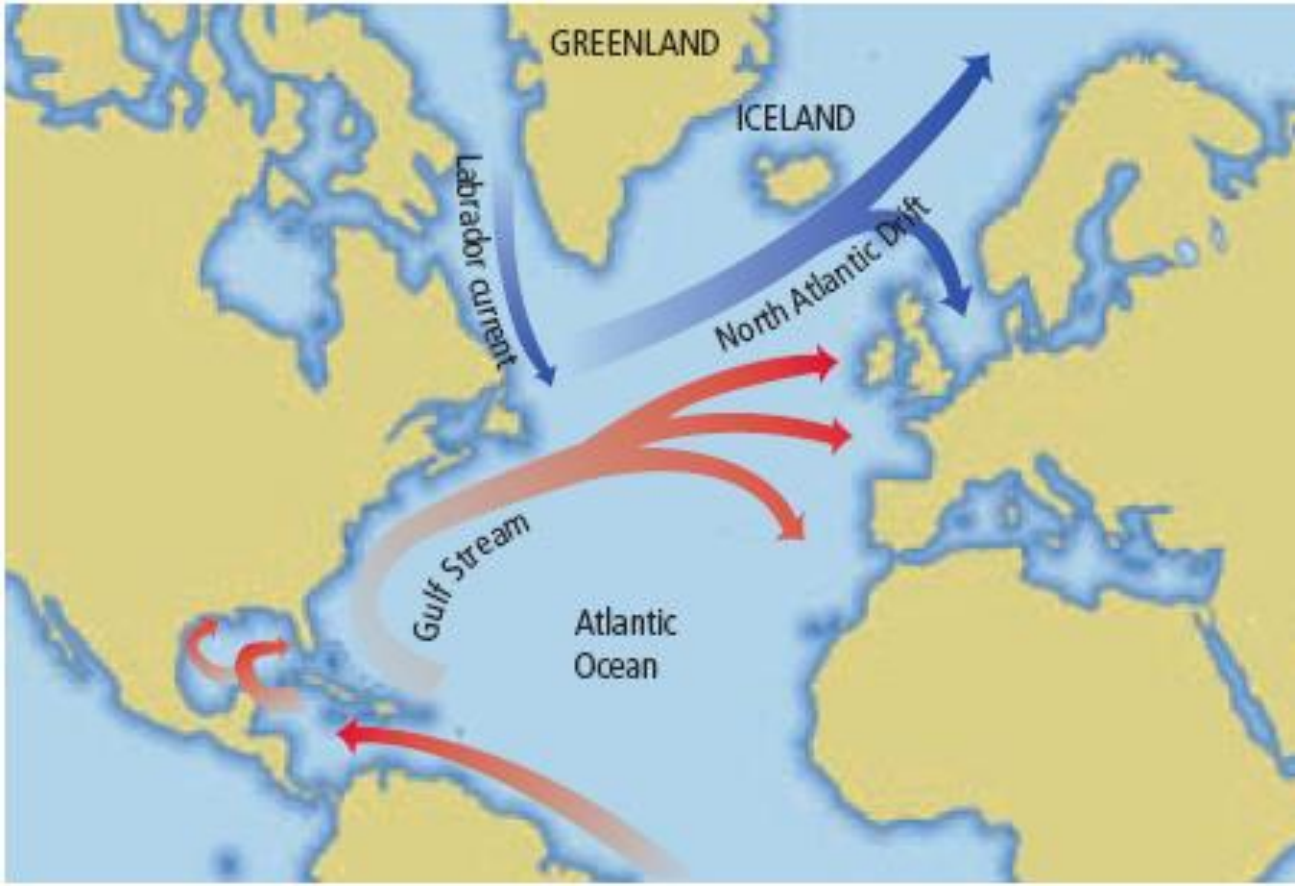
- Marine life flourishes as the upwelling bring nutrients for the phytoplankton.

Ocean Current & Climate...

- Our weather patterns are rapidly changing due to the interaction of the Labrador Current and the Gulf Stream.

Warm surface currents transfer tropical heat to the atmosphere and colder currents remove heat from the atmosphere.

•When the warm, moist air above the Gulf Stream blows over the colder water of the Labrador Current, it cools and condenses, producing fog.


GREENLAND
ICELAND
Labrador current
North Atlantic Drift
Gulf Stream
Atlantic
Ocean

- Temperature fluctuations occur rapidly in NL due to our location between warm, tropical winds moving north and cold, arctic winds moving south.

- Local atmospheric temperatures depend on which of these prevail.

Science 8

Unit 1:

Topic 12: Living in Water

Environment.

- **Ecosystem** refers the network of interactions that links the living and the non-living things in an environment.

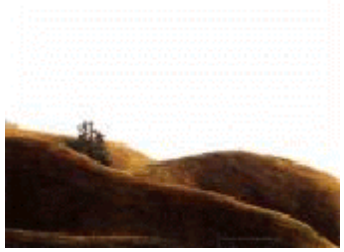
One way to study an ecosystem is to divide the environment into living and non-living parts.

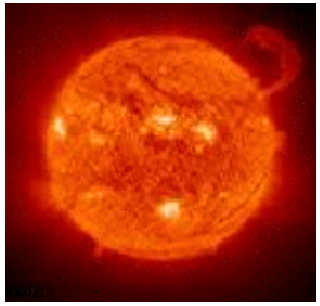
BIOTIC FACTORS

- **Biotic factors** refers to living or dead parts of the environment.
- Examples: plants, animals, and micro-organisms.

ABIOTIC FACTORS

- **Abiotic refers** to the non-living parts of the environment. .
- Examples. air, water, soil, sunlight, temperatre and landscape.





Biotic & Abiotic Factors

Place each item in the correct location in the chart:

Rotting Tree
Dead Bird
Fish
Sunlight
Bone
Air
Temperature
Rocks
Maple Tree

Biotic	Abiotic

Living in Water...

Freshwater Environments:

1. Lakes and ponds
2. Wetlands
3. Rivers and streams
4. Estuaries

Describe species found in the following freshwater environments. Be sure to include

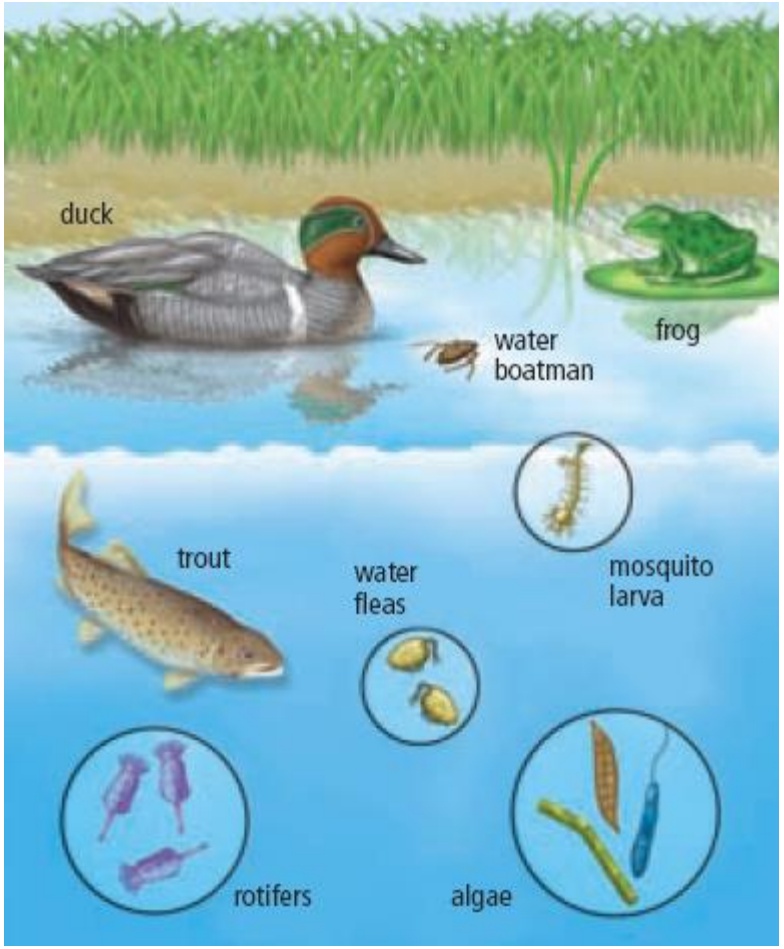
1) Invertebrates refers to organism without backbone

2) Vertebrates refers to organism with backbone

3) microorganisms very small organisms

4) Fauna refers to plant life.

Lakes and Ponds



Contains small, free floating organisms called plankton:

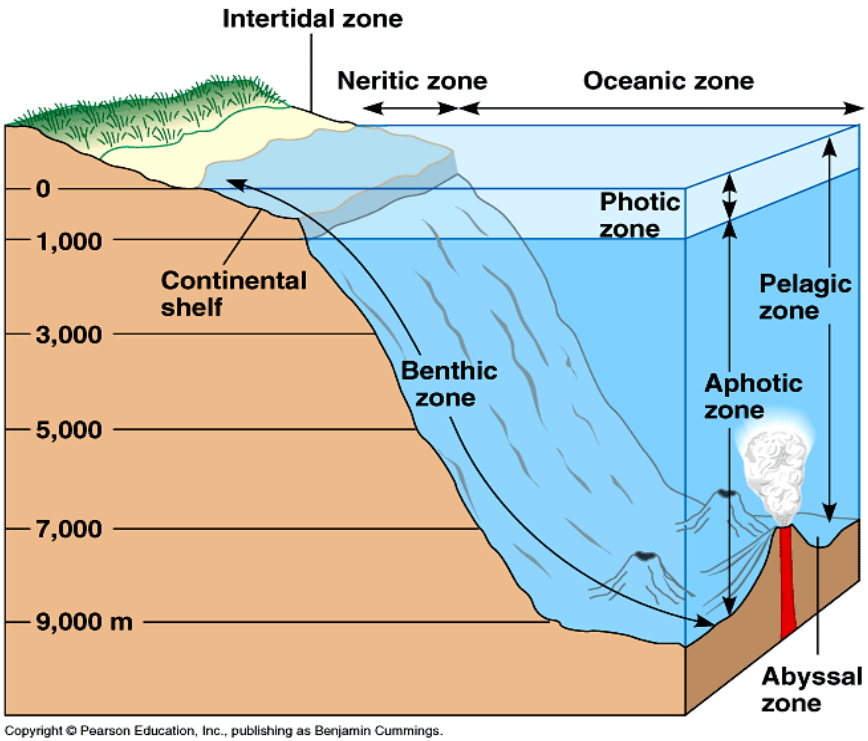
phytoplankton are microscopic plants that produce their nutrient through photosynthesis.

Zooplankton refers to tiny animals that eat other types of plankton for food.

Saltwater Environments:

1. Pelagic zone: the water column

2. Benthic zone: the ocean floor



Abiotic Factors That Affect Plant and animal distribution:

- Temperature:

  Low temperature means more dissolved oxygen.

- Dissolved Oxygen:

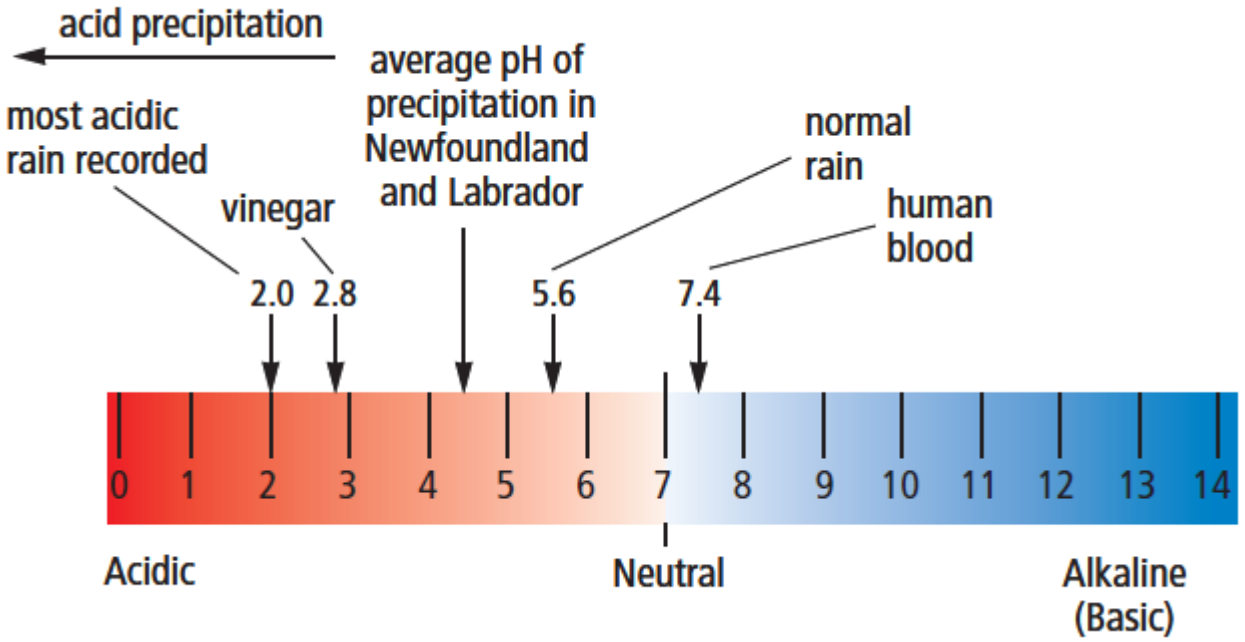
  levels should be ≥ 5mg/L

- **Phosphates:**

  levels should be < 10µg/L

- **pH**: level of acidity

  range should be 5 – 8.5



Turbidity:

how cloudy is the water

- **Pollution**

- Upwelling: the vertical motion of water in the ocean by which subsurface water of lower temperature and greater density moves toward surface of the ocean bringing with it and abundance of nutrients.

- Salinity (marine)

- Ocean currents (marine)

Core Lab Activity

Activity 3.6 p. 108- 111

"Water Health Test"

Science 8

Unit 1:

Topic 13: Marine Technologies

Marine Technologies

For Example:

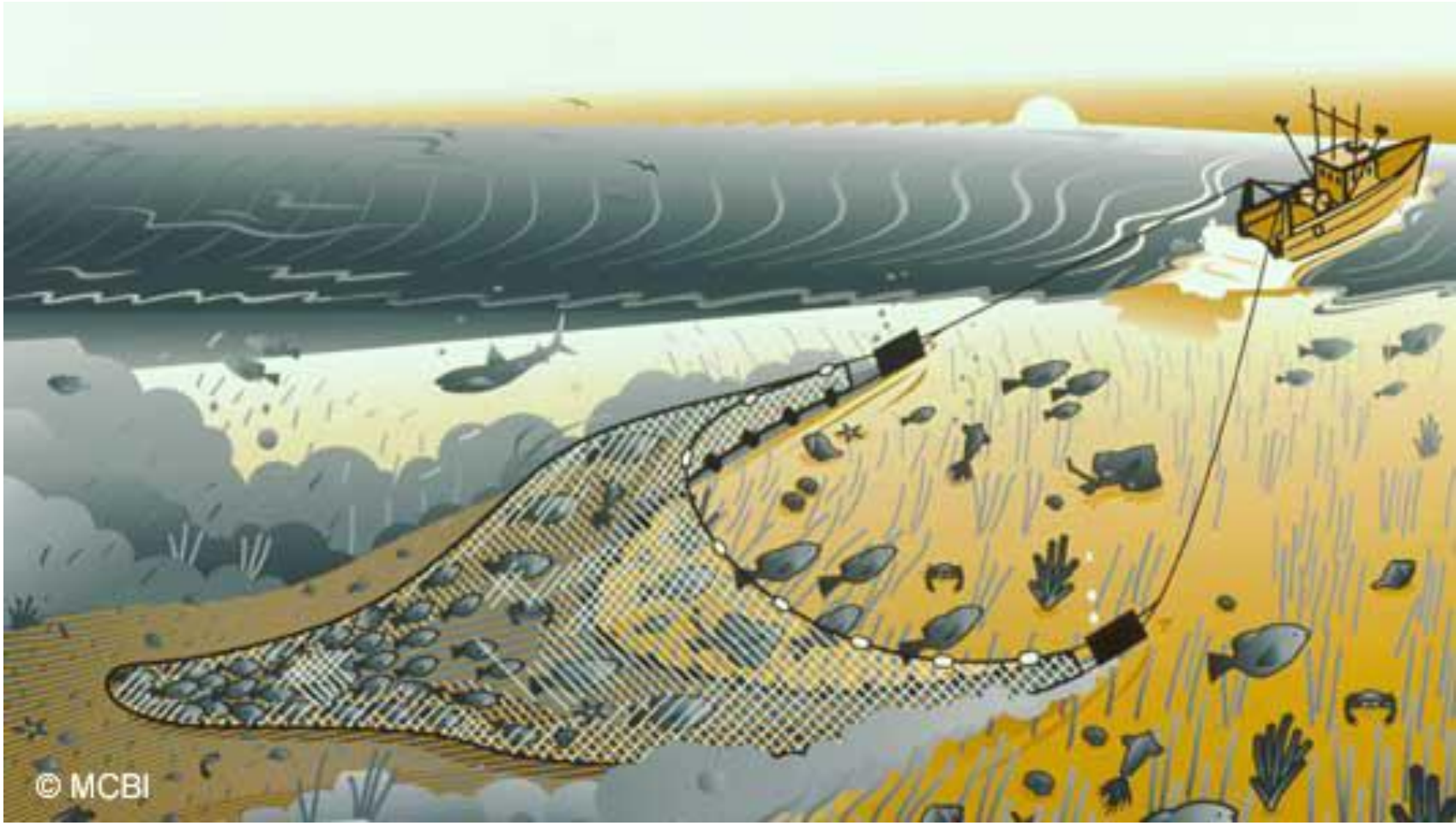
1. Confederation Bridge
2. Oil rigs
3. Sable Island gas development
4. Fundy tidal power

Overfishing... p. 105-6

Technologies that have contributed to overfishing include:

1. Fish finding technologies such as radar

2. Factory freezer trawlers



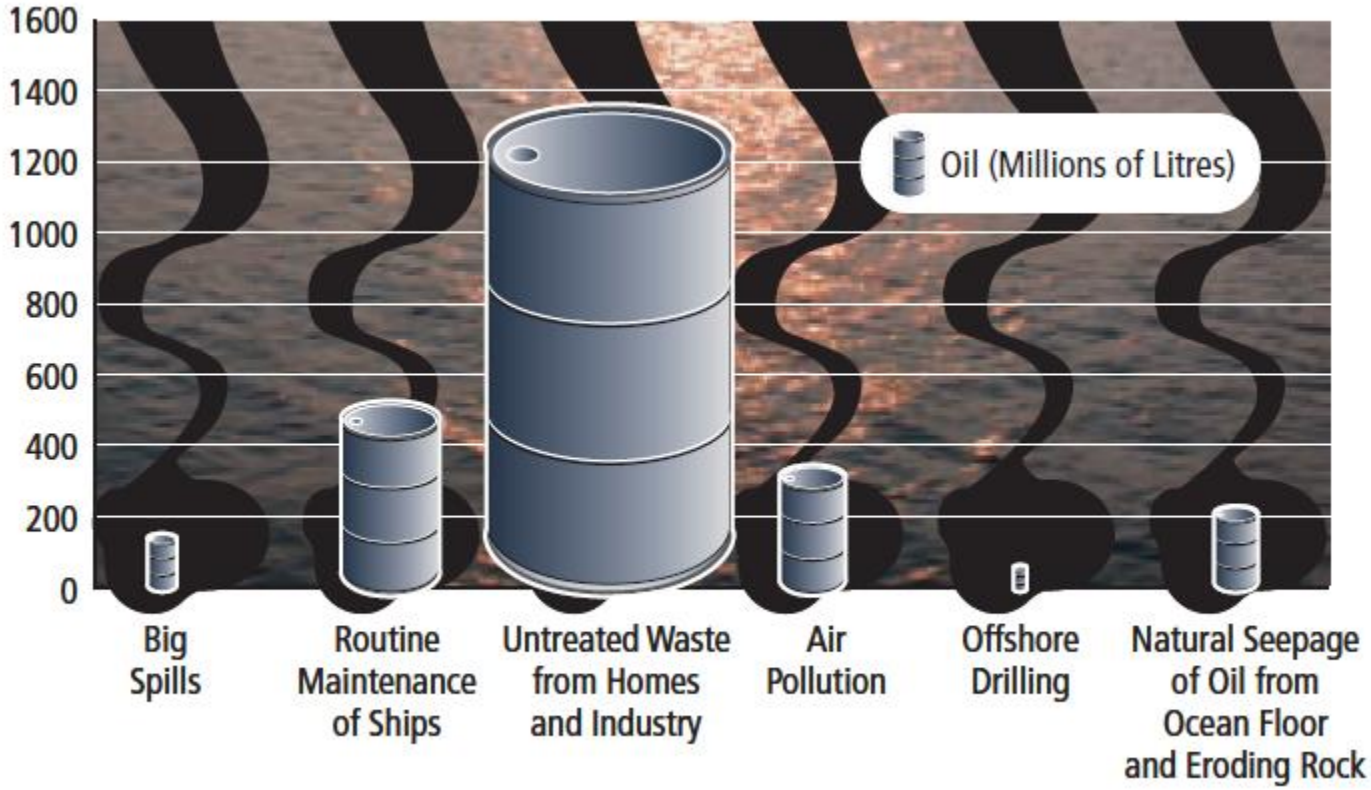
Bottom Trawling

Offshore Oil Industry...p. 104

Affects on the marine environments include:

1. Pollution
2. Scouring the ocean floor
3. Marine habitat destruction
4. Release of foreign species in bilge water

Hibernia Platform



Each year, people and industries allow more than 2 672 000 000 L of oil to spill into our oceans.

Aquaculture...p. 106-7

- The growing and harvesting of marine species in a controlled marine area.
- Usually built in sheltered areas such as a bay.
- May have accidental release of organisms and spread of diseases.