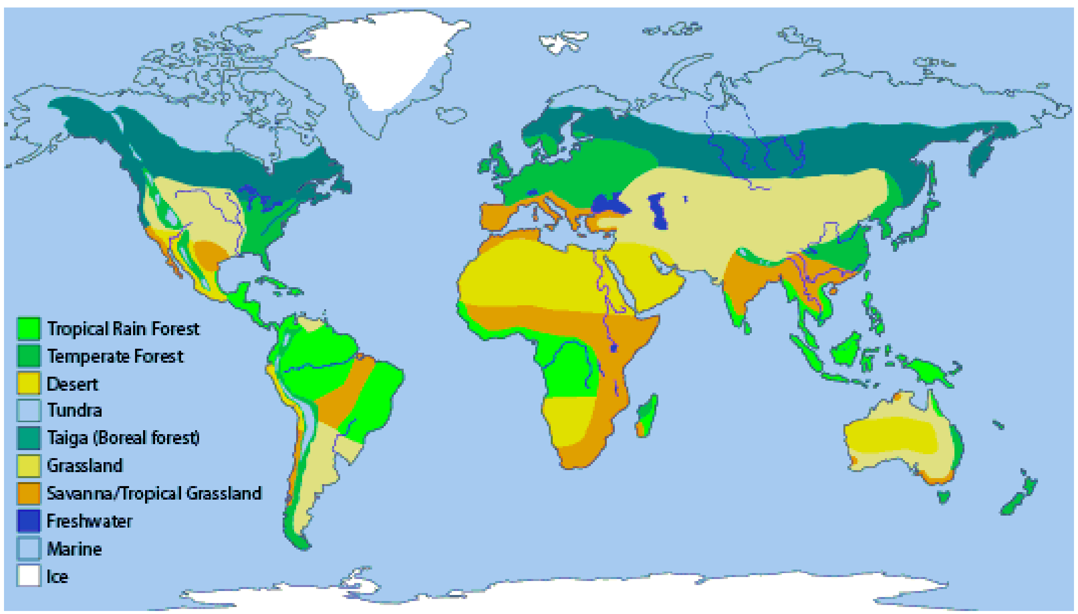
1. Ecosystems (https://www.bbc.com/education/guides/zh2p34j/revision/1)

An ecosystem is a group of **living organisms (plants and animals)** interacting with the **non-living** parts of an environment **(soil, climate, water)** Ecosystems can vary in size, e.g. a single hedgerow or a whole rainforest.
The type of plants and animals found in each ecosystem depends on the type of climate and soils. The harsh conditions of an extreme environment mean that only plants and animal species that have adapted are able to survive in the area. The vegetation, climate and soils are closely linked with one another.
A large ecosystem is called a **biome**. A biome contains particular plant and animal groups, which are adapted to that particular environment.

2. Biomes



Tropical rainforest

23.5°N - 23.5°S of the equator.
Hot and wet all year.
Rich in plants and animals.
Poor soils.

Desert

- 15-30° N and S of the equator.
- Very hot and dry.
- Limited plants.

Tundra

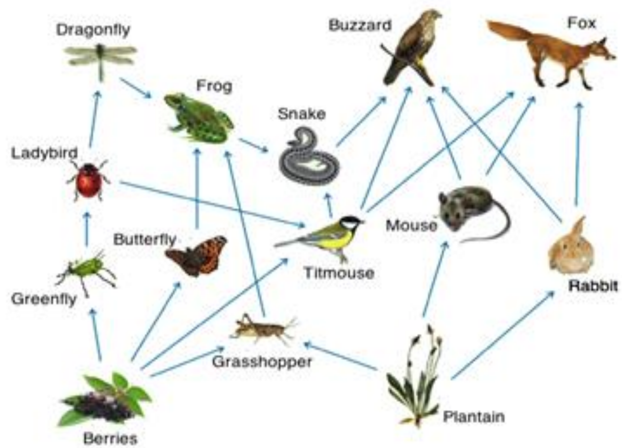
Far north.
Below freezing most of year.
Ground permanently frozen.
Light snow.

Polar

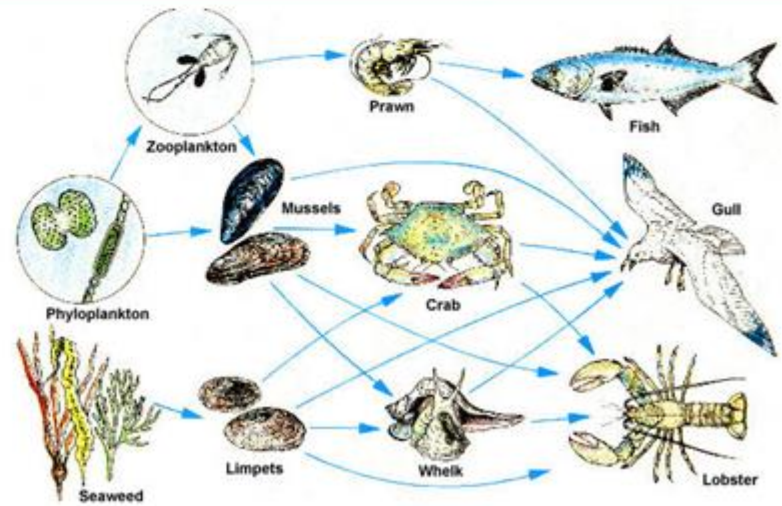
Very cold all year round.
Permanent or semi-permanent layer of ice.
Mainly found in the Arctic and Antarctic.

3. Components of an ecosystem

What would happen if all the mice died?
Think of three impacts.



What would happen if all the prawns died?
Think of three impacts.



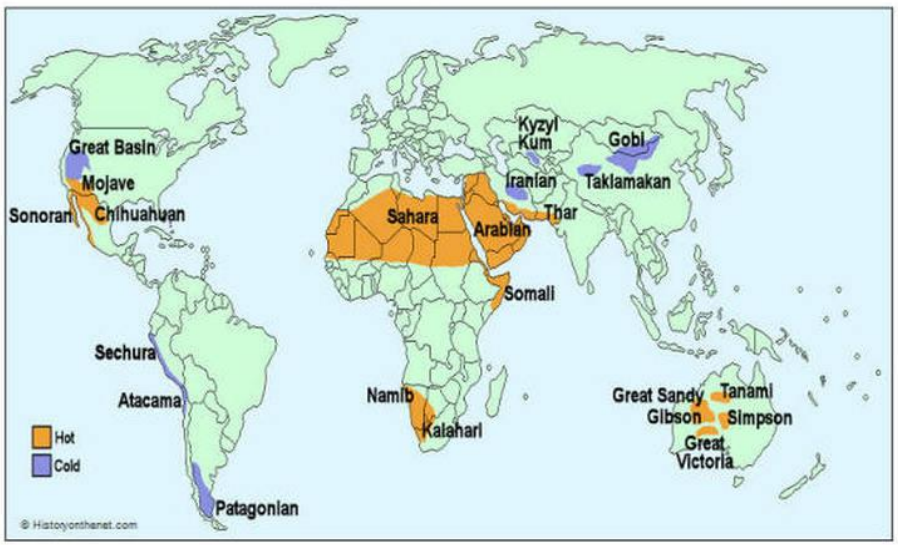
Producers	Organisms that get their energy from CO2 & water. Plants are producers
Consumers	They feed on other living things in an ecosystem
Decomposers	Organisms that break down plant & animal material; bacteria and fungi are examples of decomposers
Nutrient cycling	Nutrients are leached back into the soil from decaying plants & animal matter. These nutrients are then taken up by the plants & recycled into the food chain. Consumers can also eat detritus (decaying plants) and recycle nutrients that way.
Food chain	This shows the link between producers & consumers. It shows a simple linear series of connections.
Food web	This shows the connections between producers & consumers in a more detailed way. A food web is made up of lots of food chains and is more complex

Hot Deserts

Deserts are dry or arid areas that receive less than 250 mm of rain each year. They contain plants and animals that are specially adapted to these extremely dry conditions.

Most hot deserts are found between **15-30° north and south** of the equator.

The World's Deserts



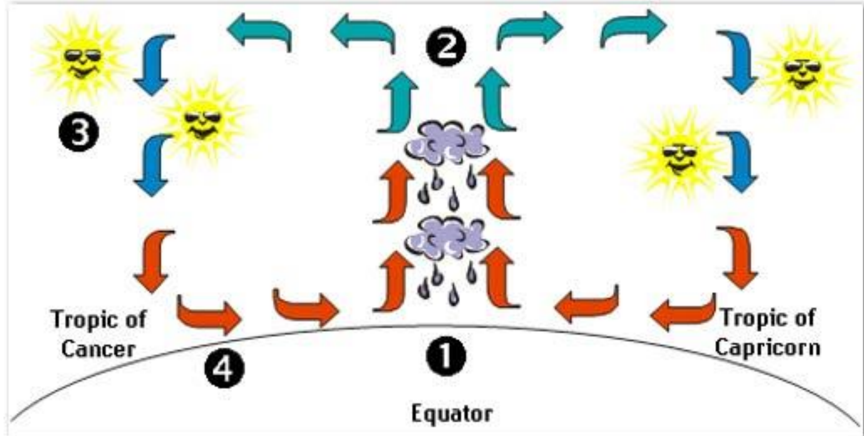
Q: Why is it possible to die of hypothermia in the hot deserts?

Q: What percentage of the worlds land surface is considered to be desert?

Q: Which is the only continent in the world not to have a hot desert?

Q: Which is the largest desert in the world?

Why are Deserts so hot and dry ?



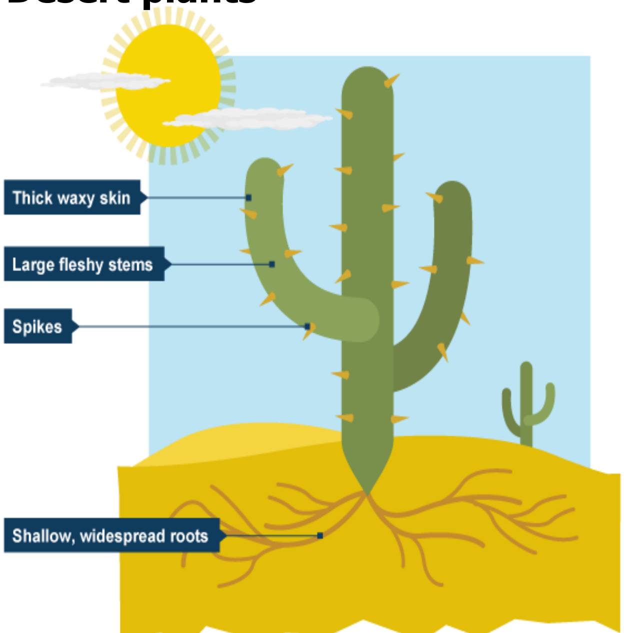
Air around the Tropics of Capricorn and Cancer is dry. This is a zone of high air pressure where the air sinks. Air at the equator rises and cools - condensation then forms rain. The air then moves north and south until it gets to about 30°N and S of the equator, where it sinks. This air is dry and no condensation can form, so there is no rain. This is known as the **Hadley Cell**. E.g. **Sahara Desert**

Some deserts are found on the western edges of continents. They are caused by **cold ocean currents**, which run along the coast. They cool the air and make it harder for the air to hold moisture. Most moisture falls as rain before it reaches the land, e.g. the **Namib Desert in Africa.**

Some deserts form in the **rain shadow of mountains**, e.g. the **Atacama Desert** is located in the rain shadow of the Andes. Air is forced to rise over mountains, air cools and condensation occurs, rain falls over the mountains, dry air sinks down the other side of the mountain. Some deserts form in areas that lie at great distances from the sea. The air here is much drier than on the coast.

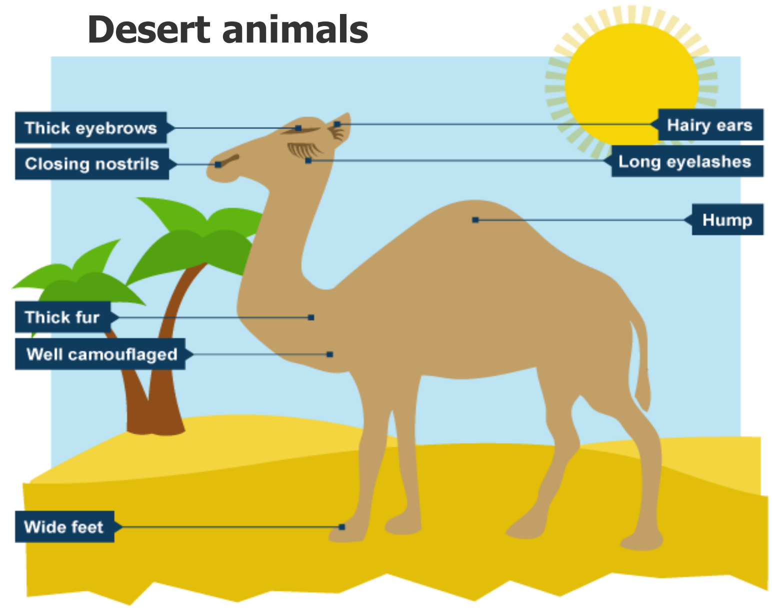
Plants and animals in the desert have to cope with very little water. There is also a big variation in temperature between day and night. Many life forms have special adaptations to cope with this. (https://www.bbc.com/education/guides/znxsgk7/revision/2)

Desert plants



- thick, waxy skin to reduce loss of water and to reflect heat
- large, fleshy stems to store water
- thorns and thin, spiky or glossy leaves to reduce water loss
- spikes protect cacti from animals wishing to use stored water
- deep roots to tap groundwater
- long shallow roots which spread over a wide area
- plants lie dormant for years until rain falls

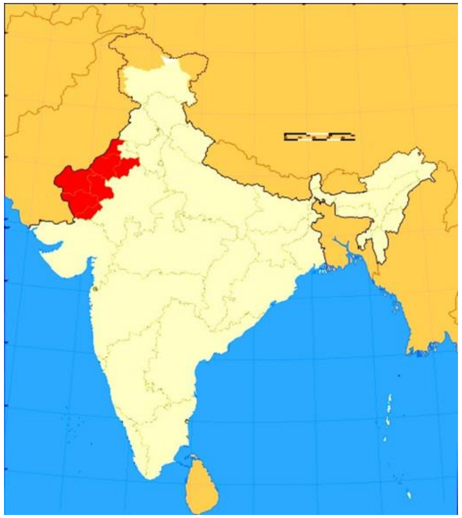
Desert animals



- long eye lashes, hairy ears and closing nostrils keep out sand
- thick eyebrows which stand out and shade eyes from the sun
- wide feet so they don't sink in the sand
- they can go without water for over a week because they can drink gallons in one go
- they can go months without food - they store fat in their humps
- body temperature can change to avoid losing water through sweating
- thick fur helps to keep them warm at night

<u>How people use the desert</u>
(http://www.bbc.co.uk/schools/gcsebitesize/geography/ecosystems/human_uses_desert_rev2.shtml)
Deserts are dry and barren places and the people that live in deserts have to deal with extremes in temperature. Despite these challenges there are still economic opportunities to make use of the desert. The Thar desert in Asia is a good example of this

<u>Where is the Thar Desert?</u>
It stretches across north-west India and into Pakistan



<u>How do people use the Thar Desert?</u>

Subsistence farming (hunting & gathering) – *growing crops and rearing animals for personal use and the family*

Commercial farming using widespread irrigation (large scale farming to make money) – *wheat and cotton can be grown*

Irrigation (use of the Indira Gandhi Canal) – *provides water to grow crops and used for drinking water*

Tourism – *the Thar Desert has beautiful landscapes. It has become a popular tourist destination. Desert safaris on camels, based at Jaisalmer, have become particularly popular with foreigners as well as wealthy Indians from elsewhere in the country. Local people benefit by acting as guides or by rearing and looking after camels.*

Mining – limestone & gypsum (used to make plaster) are found in the Thar Desert. They are valuable in the building industry

What are the problems in the Thar Desert?

- **soil erosion** – soil is left bare after over farming and overgrazing. The wind can pick up speed due to the exposed open areas and blow the top soil away making soil erosion even worse.

- **trees are removed for fuelwood** which makes soil erosion even worse. This causes **desertification**

- **salinization** – water in the soil evaporates due to high temperatures. This draws salts to the surface which is toxic to many plants.

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- **population pressure** - the Thar Desert is the most densely populated desert in the world, with a population density of 83 people per square km, and the population is increasing. This is putting extra pressure on the fragile desert ecosystem and leading to overgrazing, over cultivation and ultimately **desertification**

- **tourism** - although tourists bring benefits such as employment and extra incomes, the environment that they have come to enjoy is fragile and will suffer if tourism becomes overdeveloped

Tropical Rainforests

https://www.bbc.com/education/guides/zpmnb9q/revision/1

Tropical rainforests are found between the Tropics of Cancer and Capricorn, 23.5° N and S of the equator. The tropical rainforest contains far more species of plants and animals than any other biome. They cover approximately six per cent of the Earth's surface, and because they get 2,000 mm of rain per year and temperatures range from around 27 to 32°C, conditions are wet and hot all year round so it is a good environment for growth.

Emergents

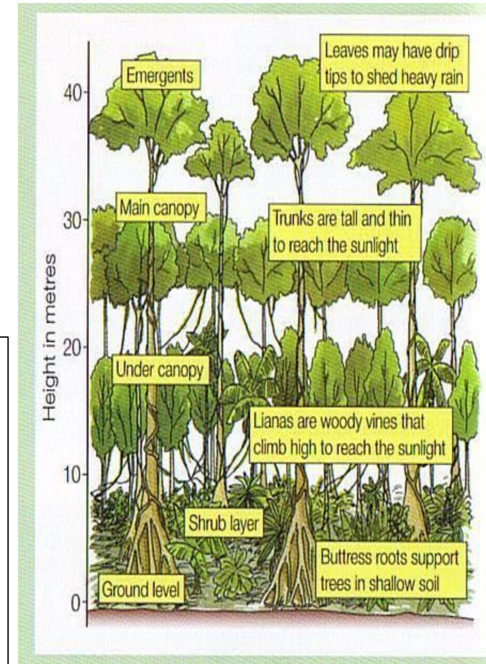
These are the very tallest trees that emerge from the upper canopy - up to 50 meters in height. Lots of animals live here as it has the most sunlight.

Canopy

The second highest layer (30-45 meters). The trees merge together to form a dense canopy. It contains the most plant species because it intercepts a lot of rainfall and receives a lot of sunlight.

Under canopy

Low light conditions (2-15%) there is only dense vegetation along the rivers and in openings where light gets in



Forest floor

Very little light reaches the floor so plants grow slowly. The ground is covered in fallen leaves, rotting branches and there is a network of shallow roots

Plants in the tropical rainforest
https://www.bbc.com/education/guides/zpmnb9q/revision/3

Plants grow thick leaves with **drip tips** and **waxy surfaces** to allow water to drain quickly to prevent rotting.
Some plants called **'epiphytes'** are flowering plants which grow on tree trunks and branches to get light. They get food from the air and water, and their roots hang in the air, e.g. orchids

Carnivorous plants are **meat-eating plants** that attract insects using smelly nectar and then trap them.
Rainforest soils are poor and most nutrients are in the top layers, so roots are generally shallow.

Wide buttress roots join the tree far up and help to **support** and anchor the tree. They also allow it to gather more nutrients

Animals in the tropical rainforest

Only a small percentage of the animals live on the forest floor. Many live in the trees. It is thought that in the Amazon rainforest there are over 2,000 species of birds and 1,500 species of fish. There is also thought to be 50,000 kinds of insects in a single square mile.

Why are rainforests important? **https://www.bbc.com/education/guides/zpmnb9q/revision/4**

In some areas there is pressure to use rainforest resources to help development but this can lead to resources being exploited in an unsustainable way. Some developers are willing to do anything to make money but there would be long-term negative impacts for the whole planet

The rainforests are so important because they are home to:

- oxygen - the rainforest vegetation takes in carbon dioxide and gives out oxygen
- medicines - a quarter of all natural medicines were discovered here
- undiscovered species
- food, e.g. vanilla, chocolate, nuts, ginger and pepper
- resources, such as rubber and bamboo
- wood
- minerals
- river networks
- The challenge is for the governments of poorer countries to protect large areas of forest. They have difficult decisions to make about how to use their resources.

Deforestation of the rainforest

Deforestation means the removal of trees. It is happening at an alarming rate. It is estimated that an area of rainforest about the size of a football pitch is destroyed each second.

Causes of deforestation

Logging	Commercial logging companies cut down trees for timber, which is mostly sold to developed countries. In most cases, large areas of forest are destroyed just to remove a few highly valued trees. The effect of this devastation has lasting consequences: • heavy machinery compacts soil and makes it more vulnerable to erosion • silt is washed into rivers • logging roads open up the area to new settlers who remove even more trees
Farming	Land is cleared (e.g. by slash and burn) and planted with cash crops, usually just one - such as palm oil. Alternatively, it will be used for grazing by cattle ranchers. Most cash crops and cattle are eventually sold to developed countries. These actions affect the soil for future use because fertility falls after just a few years. Only farmers who can afford fertilisers will be able to use the soil to grow crops in the future. If they can't afford fertilisers, farmers simply move on and clear more land, so more forest is lost.
Mining	Land is completely deforested. Soil is often removed with high-pressure hoses and chemicals are used. The run-off goes into local rivers and pollutes them. Huge scars from open-cast pits are left - the soil can't recover.
Building roads	Loggers and miners build roads to get their materials out. People use the roads to enter the forest and build new settlements and set up industries. The Trans-Amazonian Highway in South America is 5,300 km long and has opened up some remote parts of Brazil to development.
Fuelwood	Many people rely on wood for their main source of fuel, particularly in developing countries. As the population grows, more wood is chopped down.

Problems of deforestation

- Less biodiversity - *a loss of plant and animal species*
- Loss of habitats - *places for animals to live.*
- Loss of sources of medicine – *we may be losing a potential cure for cancers and HIV?!?*
- Soil erosion – *soil becomes useless when it is washed away as the roots no longer hold together the soil*
- Silting-up of rivers – *eroded soil is washed into the rivers*
- Flooding – *lack of interception, absorption by roots and soil erosion result from deforestation which leads to more water entering the rivers*
- Global warming and rising sea levels - *burning trees releases greenhouse gases which add to global warming. Trees take in carbon dioxide and reduce the effects of global warming.*

What can be done to protect tropical forests?

- ✓ Selective logging - *only some trees cut down.*
- ✓ Replanting trees.
- ✓ Environmental laws which make logging illegal, though this is hard to police.
- ✓ Setting up national parks and nature reserves – *to protect more fragile areas from development*
- ✓ Encouraging ecotourism – *if locals can make money this way they will be less likely to cut down trees*
- ✓ Encourage people to stop buying tropical hardwood – *encourage upcycling or buying from sustainable sources*
- ✓ Helping poorer countries develop - *so they don't have to use rainforest resources unsustainably.*
- ✓ Using elephants, horses or helicopters to drag or fly selected logs out – *cuts down on the need to build roads and destroy more forest*

Key Terms

Some key terms for ecosystems ………..			
Ecosystem	A unit or an area including all living and non-living things	Irrigation	The watering of crops
Biome	A large ecosystem found in many areas	Desertification	the process by which fertile land becomes desert, typically as a result of drought, deforestation, or inappropriate agriculture.
Producer	An organism using sunlight energy to produce food e.g. plants	Emergent	The tallest trees in the rainforest. Up to 50 metres+
Consumer	An organism that gets its energy by eating other organisms i.e. plants or other consumers	Canopy	The main top layer of the rainforest
Decomposer	An organism that gets its energy by breaking down dead material. Bacteria and fungi are decomposers	Epiphytes	a plant that grows on another plant e.g. orchids growing on tree trunks in tropical rainforests.
Nutrient cycling	Recycling of energy through plants, consumers and decomposers	Buttress roots	large, wide roots on all sides of a shallowly rooted tree. Typically, they are found in nutrient-poor rainforest soils and do not penetrate to deeper layers. They prevent the tree from falling over while also gathering more nutrients.
Food chain	Link between producer and consumers i.e. grass- grasshopper – rat – snake –hawk	Deforestation	The removal of trees through burning or chopping down
Food web	Made up of several food chains. It is a more complex web	Logging	the activity or business of felling trees and cutting and preparing the timber.
Desert	A dry, barren region with little vegetation and less than 250mm of rain annually	Biodiversity	the variety of plant and animal life in a particular habitat, a high level of which is usually considered to be important and desirable.
Subsistence farming	Growing enough food for yourself or family	Habitat	the natural home or environment of an animal, plant, or other organism.
Commercial farming	Farming as a business to make money		