## Ecosystem - Key terms

| Key term | Definition |
|---|---|
| Ecosystem | A community of plants and animals that interact with one another and their physical environment. |
| Abiotic | Relating to non living things. |
| Biotic | Relating to living things. |
| Producer | An organism or plant that is able to absorb energy from the sun through photosynthesis. |
| Primary consumer | Creature that eats plant matter. Also known as a herbivore. |
| Secondary consumer | Creature that eats other animals. Also known as a carnivore. |
| Decomposer | An organism that breaks down dead plant and animal matter. |
| Food chain | The connections between different organisms that rely on one another as their food source. |
| Food web | A complex hierarchy of plants and animals relying on each other for food. |
| Biome | A large global ecosystem with flora and fauna adapting to their environment. |

## Trophic levels

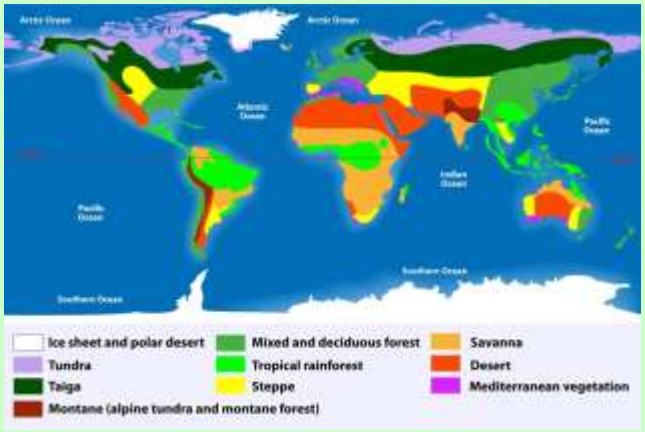
| Trophic Level | Source of Energy | Examples |
|---|---|---|
| Producers | Solar energy | Green plants, photosynthetic protists and bacteria |
| Herbivores | Producers | Grasshoppers, water fleas, antelope, termites |
| Primary Carnivores | Herbivores | Wolves, spiders, some snakes, warblers |
| Secondary Carnivores | Primary carnivores | Killer whales, tuna, falcons |
| Omnivores | Several trophic levels | Humans, rats, opossums, bears, racoons, crabs |
| Detritivores and Decomposers | Wastes and dead bodies of other organisms | Fungi, many bacteria, earthworms, vultures |

At each (trophic) level of the food chain the number of individuals declines. This is because not all individuals in any trophic level are consumed (eaten). This means not all energy is passed up to the next trophic level.

## Ecosystem - A question of scale

Ecosystems can be any size.
- Local e.g. a pond or under a dead log. Also called a habitat.
- Regional e.g. the upland moorland of the Pennines in the north of England.
- Global e.g. tropical rainforest. Also called biomes.

## Distribution of Biomes




| Biome | Key Characteristics |
|---|---|
| **Tropical Rainforests** | •Along equator (Asia, Africa / South America). •6% of earth's surface. •25°C – 30°C and over 250mm rain per month. |
| **Tropical Grasslands (Savanna)** | •Between equator and tropics. •20 – 30°C and between 500 - 1500 mm of rain per year. •Wet and dry seasons. |
| **Deserts** | •Tropics (Sahara and Australia). •Over 30°C and less than 300 mmm per year rain. •20% of land's surface. |
| **Deciduous forests** | •Higher latitudes (W Europe, N America, New Zealand). •5 – 20°C and between 500 – 1500 mm rain per year. •4 distinct seasons. •Lose leaves in the winter to cope with the cold. |
| **Coniferous forest (Taiga)** | •60°N (Scandinavia / Canada). •Cone bearing evergreen trees. •No sunlight for part of the year. |
| **Tundra** | •Above 60°N (Arctic Circle). •Less than 10°C and less than 500mm per year rain. •Cold, icy and dry means 2 month growing season. |

## A small scale ecosystem - Bradgate Park

Bradgate Park is a country park to the north west of Leicester. It covers 850 acres and has a wide range of flora (plants) and fauna (animals).

The park attracts almost 1 million visitors each year.

The park has a wide range of trees including oak trees, and small areas of pine trees. There are large areas of bracken. Deciduous trees and bracken provide leaves that decompose and enrich the soil as well as providing leaf litter for insects.

The bracken provides cover and nesting areas for birds such as skylarks, yellowhammers and meadow pipits, as well as cover for the deer in the park. Kingfishers and reed buntings live alongside the River Lin as it flows through the park.

The park is managed by annual deer culls to keep deer numbers at sustainable levels. In the autumn the bracken is rolled flat to encourage nutrients back into the soil and stop the bracken spreading over the grass on which deer graze.

## Changes within ecosystems

If any component within an ecosystem is changed it will have a knock on effect on the rest of the ecosystem.
An example of where this happened was in Yellowstone National Park in the USA when they reintroduced wolves in 1995.

16 packs of grey wolves introduced. Each pack kills one elk a day.

Elk population falls from 20,000 to 10,000 in 8 years.

Competition from wolves results in decrease in coyote population.

More kills by wolves = more food for scavengers.

Reduction in grazing pressure. Aspen and cottonwood regenerate. There is more tree cover.

Reduction in predation from coyotes leads to increase in mice and voles.

Increase in populations of grizzly bears, cougars, ravens, magpies and eagles.

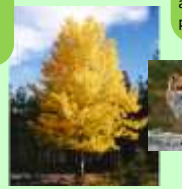
Increase in bank side trees stabilises river banks so there is less erosion. More woody debris in rivers creates pools and trout habitats.

Beavers create ponds and flooded areas, which promote growth of aspen.

Regeneration of aspen attracts beavers, which begin to recolonise Yellowstone.

Increased tree cover provides habitats for birds.

Populations of predators of small rodents e.g. red foxes and birds of prey, increase.

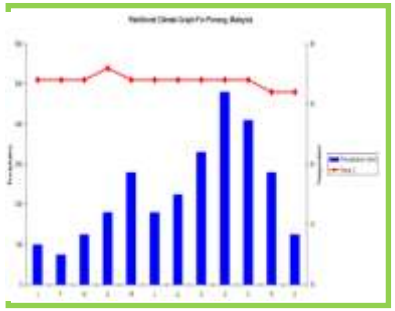


Unit 1b

# The Living World

## Rainforest Climate

Temperatures are high all year ( around 28°C). Rainfall is around 250mm per month.

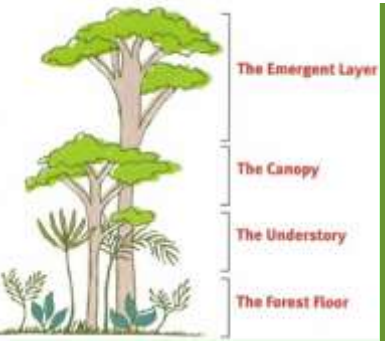


## Tropical Rainforest - Animals

- Jaguars have spotted fur. This camouflages them in the dappled shade of the forest floor.
- Parrots have strong, sharp beaks to help them crack open nuts.

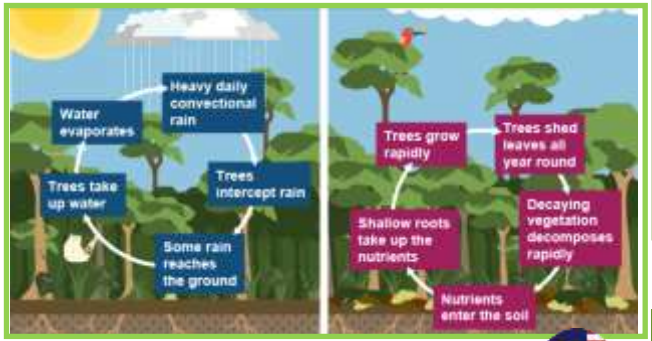
- Spider monkeys have a prehensile tail that allows them to cling to branches. Sharp nails allow them to peel bark.
- Poison dart frogs are a bright colour to warn predators away.

## Tropical Rainforest - Vegetation




- Competition for light causes trees to grow fast. They are tall and straight. Buttress roots support these tall trees.
- Plants on the forest floor are shade tolerant and able to cope in the darker conditions.
- Epiphytes grow high up on the branches of trees to gain access to the light.
- Lianas wrap themselves around other trees to gain access to light.
- Plants have drip tips.

## Water and Nutrient Cycle




## Causes of deforestation in Malaysia

| | |
|---|---|
| **Commercial farming** | During the 1970's large areas of forest were cleared for palm oil plantations |
| **Logging** | Malaysia became the world's largest exporter of tropical wood in the 1980's. This led to total destruction of forest habitats |
| **Mineral extraction** | The removal of mineral resources from the earth. Malaysia mines tin and clears forest for mines and transport networks |
| **Subsistence farming** | A type of agriculture producing food and materials for the benefit only of the farmer and his family or community. Small scale, often slash and burn. |
| **Hydro - electricity** | The Bakun Dam have been built and large areas (700km²) of rainforest destroyed by flooding. |
| **Resettling** | 1 million people have been encouraged to move away from squatter settlements and into the rainforest. They have been given land which has been cleared (approx. 15,000 hectares) to allow farming. |
| **Roads** | Roads built to access settlements and mines. Opened up rainforest, but allowed loggers in. |

## Effects of deforestation in Malaysia

**Economic development**
•Brings in jobs and income. •Destroys resources in the long term. •Livelihoods of locals destroyed. •Products such as palm oil and rubber supply raw materials •Minerals such as gold are very valuable •Hydro-electric Power is cheap and clean energy

**Soil erosion**
•Land left unprotected from heavy rain leads to landslides and flooding. •Nutrients are washed away decreasing nutrients in the soil. •Rivers silt up.

**Contribution to climate change**
•Trees cut down change the water cycle and make it drier. •Rainforests are the lungs of the earth and so when deforested there is more carbon dioxide in the air and less oxygen. •Burning also releases carbon dioxide into the air (Greenhouse effect).

**Others**
•Loss of biodiversity - 137 species a day. •Loss of indigenous tribes (90 since 1990). •Tribal people moving to towns and cities and have drugs and alcohol issues. •Loss of indigenous knowledge. •Conflicts between developers and indigenous people.

## Protecting the Rainforest

- **Selective logging**. Only fell fully grown trees. Mark sustainable trees for sale.
- **Conservation & education**. WWF (NGO) educate and train conservation workers. Buy threatened areas.
- **Ecotourism**. Minimises damage to the environment and benefits locals. This creates incentive to protect the forest.
- **International agreements**. International Tropical Trade Agreement restricts trade in hard woods.
- **Debt reduction**. In 2010 the USA converted $13.5 million from Brazil and used to protect forest.

## Hot Deserts

## NOT hot desserts

To be defined as a Hot Desert, there must be:
-Less than 250mm of rain a year.
- Diurnal temperatures ranging from 50°C during the day to 0°C at night.

## Desert - Challenges

**Extreme Temperatures** Temperatures are over 40 degrees during the day and drop below freezing at night.

**Inaccessibility** – The Sahara is huge making travel difficult and expensive.

**Water Supply** - low rainfall makes water for drinking, washing and agriculture difficult to supply.

## Desertification - Causes

Desertification is where land is gradually turned into desert, usually on the edge of a desert. It is caused by overgrazing by cattle or trees being cut down for firewood. Population growth is a key factor. Climate change will lead to more droughts that kill vegetation and cause the problem to spread. In the area to the south of the **Sahara**, known as the **Sahel** heavy rainstorms can wash away the exposed soil in a couple of hours.

| Desert - Opportunities | Specific Detail |
|---|---|
| Mineral resources - mineral resources from the earth can be used by industry or sold for export. | Morocco is the world's largest exporter of phosphate which is used in fertilisers and batteries. The money gained can be used to develop the country. |
| Oil and gas - oil is trapped in huge aquifers deep underground. It is an extremely valuable resource. | Algeria is a leading exporter of oil and gets 60% of its income from the oil and gas industry. It has many huge oilfields e.g. Hassi Messaoud. The industry provides jobs for 40,000 people. |
| Solar energy - with 12 hours of cloudless sunshine every day, deserts are ideal locations for this form of electricity generation. | Tunisia is planning a huge development that will supply enough electricity to meet the needs of 2 million homes in Western Europe. Solar power does not contribute to global warming. |
| Tourism – deserts are remote, romantic and exotic locations for tourists.  | You can go camel trekking in Morocco. Cities like Marrakech are popular with many tourists visiting the famous souk (market). Increasing opportunities for sand-boarding and dune buggies exist. |
| Farming - only possible where there is access to water through irrigation. | Egypt doubled the amount of land where crops were grown by building the Aswan Dam to control the flow of the Nile and irrigate the surrounding desert. |

## Desertification - Solutions

Irrigation - Water from aquifers used to grow crops / vegetation.

National Parks - Conserve areas at risk, protect wildlife.

Afforestation - Green wall being planted across the Sahel.

Crop rotation - Keeps nutrients in the soil by avoiding monoculture.

Appropriate Technology - Use of suitable crops, magic stones, terraces.

## Sahara Desert – Northern Africa

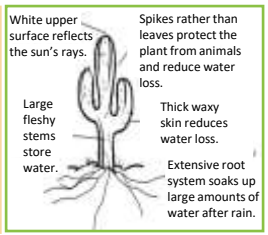
**Opportunities** •Farming using water from Aswan Dam. •Mineral extraction e.g. phosphates in Morocco & Oil/gas in Algeria. •Energy. Tunisia Solar Project will produce enough energy for 2m homes. •Tourism e.g. camel trekking and dune buggies

**Challenges** •Temperatures reach up to 50°C. •Lack of roads meant limited access until late 1800s. •Water is limited and has to be transported from aquifers or dams. •Over-extraction leads to conflict. •Conflict with nomadic groups

## Desert plants

High temperatures should lead to rapid growth but this is not possible due to the lack of moisture. Vegetation is sparse and usually confined to water holes.

Lack of rainfall is the main limit on plant growth. Plants have thin leaves or spines to reduce water loss and long roots to reach deep underground water. The Cactus is a common desert plant.




## Desert Animals

The limited number of producers means the number of consumers is also low.

Animals need to be able to tolerate the range of temperatures in the desert. Many do this by staying underground during the day. They also need to find ways to cope with the limited availability of water. Some gain enough water from their food. Others extract water from air.