

What is an Ecosystem?

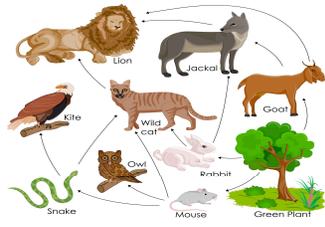
An ecosystem is a system in which organisms interact with each other and with their environment.

Ecosystem's Components

Abiotic These are **non-living**, such as air, water, heat and rock.

Biotic These are **living**, such as plants, insects, and animals.

Flora	Plant life occurring in a particular region or time.
Fauna	Animal life of any particular region or time.

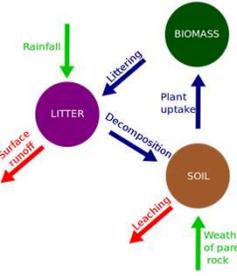


Food Web and Chains

Simple **food chains** are useful in explaining the basic principles behind ecosystems. They show only one species at a particular trophic level. **Food webs** however consists of a network of many food chains interconnected together.

Nutrient cycle

Plants take in **nutrients** to build into new organic matter. Nutrients are taken up when animals eat plants and then returned to the soil when animals die and the body is broken down by **decomposers**.

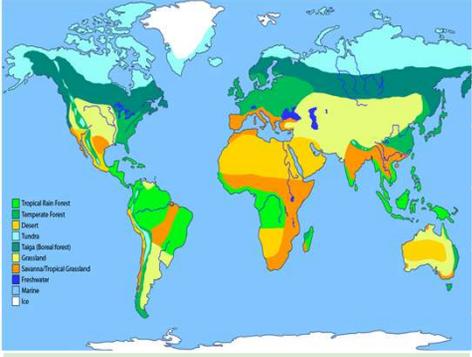


Litter This is the surface layer of vegetation, which over time breaks down to become **humus**.

Biomass The total mass of **living organisms** per unit area.

Biomes

A biome is a **large geographical area of distinctive plant and animal groups**, which are adapted to that particular environment. The climate and geography of a region determines what type of biome can exist in that region.



Coniferous forest
Deciduous forest
Tropical rainforests
Tundra
Temperate grasslands
Tropical grasslands
Hot deserts.

The **most productive biomes** – which have the greatest biomass- grow in climates that are **hot and wet**.

Biome's climate and plants

Biome	Location	Temperature	Rainfall	Flora	Fauna
Tropical rainforest	Centred along the Equator.	Hot all year (25-30°C)	Very high (over 200mm/year)	Tall trees forming a canopy; wide variety of species.	Greatest range of different animal species. Most live in canopy layer
Tropical grasslands	Between latitudes 5°- 30° north & south of Equator.	Warm all year (20-30°C)	Wet + dry season (500-1500mm/year)	Grasslands with widely spaced trees.	Large hooved herbivores and carnivores dominate.
Hot desert	Found along the tropics of Cancer and Capricorn.	Hot by day (over 30°C) Cold by night	Very low (below 300mm/year)	Lack of plants and few species; adapted to drought.	Many animals are small and nocturnal: except for the camel.
Temperate forest	Between latitudes 40°- 60° north of Equator.	Warm summers + mild winters (5-20°C)	Variable rainfall (500-1500mm/year)	Mainly deciduous trees; a variety of species.	Animals adapt to colder and warmer climates. Some migrate.
Tundra	Far Latitudes of 65° north and south of Equator	Cold winter + cool summers (below 10°C)	Low rainfall (below 500mm/year)	Small plants grow close to the ground and only in summer.	Low number of species. Most animals found along coast.
Coral Reefs	Found within 30° north – south of Equator in tropical waters.	Warm water all year round with temperatures of 18°C	Wet + dry seasons. Rainfall varies greatly due to location.	Small range of plant life which includes algae and sea grasses that shelters reef animals.	Dominated by polyps and a diverse range of fish species.

Unit 1b The Living World

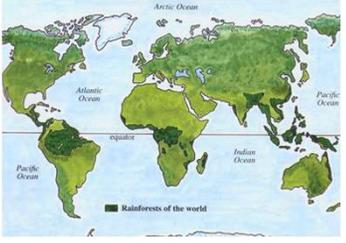


Tropical Rainforest Biome

Tropical rainforest cover about 2 per cent of the Earth's surface yet they are home to over half of the world's plant and animals.

Interdependence in the rainforest

A rainforest works through interdependence. This is where the plants and animals depend on each other for survival. If one component changes, there can be serious knock-up effects for the entire ecosystem.



Distribution of Tropical Rainforests

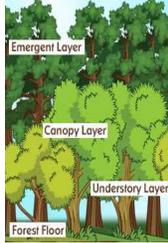
Tropical rainforests are centred along the Equator between the Tropic of Cancer and Capricorn. Rainforests can be found in South America, central Africa and South-East Asia. The Amazon is the world's largest rainforest and takes up the majority of northern South America, encompassing countries such as Brazil and Peru.

CASE STUDY: UK Ecosystem: Epping Forest, Essex



This is a typical English lowland deciduous woodland. **70% of the area** is designated as a **Site of Special Scientific Interest (SSI)** for its biological interest, with **66%** designated as a **Special Area of Conservation (SAC)**.

Components & Interrelationships	Management								
<table border="1"> <tr> <td>Spring</td> <td>Flowering plants (producers) such as bluebells store nutrients to be eaten by consumers later.</td> </tr> <tr> <td>Summer</td> <td>Broad tree leaves grow quickly to maximise photosynthesis.</td> </tr> <tr> <td>Autumn</td> <td>Trees shed leaves to conserve energy due to sunlight hours decreasing.</td> </tr> <tr> <td>Winter</td> <td>Bacteria decompose the leaf litter, releasing the nutrients into the soil.</td> </tr> </table>	Spring	Flowering plants (producers) such as bluebells store nutrients to be eaten by consumers later.	Summer	Broad tree leaves grow quickly to maximise photosynthesis .	Autumn	Trees shed leaves to conserve energy due to sunlight hours decreasing.	Winter	Bacteria decompose the leaf litter, releasing the nutrients into the soil.	<ul style="list-style-type: none"> - Epping has been managed for centuries. - Currently now used for recreation and conservation. - Visitors pick fruit and berries, helping to disperse seeds. - Trees cut down to encourage new growth for timber.
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Layers of the Rainforest

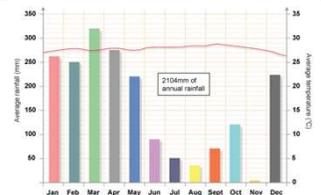
Emergent	Highest layer with trees reaching 50 metres.
Canopy	Most life is found here as it receives 70% of the sunlight and 80% of the life.
U-Canopy	Consists of trees that reach 20 metres high.
Shrub Layer	Lowest layer with small trees that have adapted to living in the shade.

Rainforest nutrient cycle

The hot, damp conditions on the forest floor allow for the rapid decomposition of dead plant material. This provides plentiful nutrients that are easily absorbed by plant roots. However, as these nutrients are in high demand from the many fast-growing plants, they do not remain in the soil for long and stay close to the surface. If vegetation is removed, the soils quickly become infertile.

Climate of Tropical Rainforests

- Evening temperatures rarely fall below 22°C.
- Due to the presence of clouds, temperatures rarely rise above 32°C.
- Most afternoons have heavy showers.
- At night with no clouds insulating, temperature drops.



Tropical Rainforests Case Study: The Amazon Rainforest



The Amazon is the largest tropical rainforest on earth, covering about 8 Million km square. It covers parts of Brazil, Peru, Columbia, Venezuela, Ecuador, Bolivia, Guyana, Suriname and French Guiana.

Since the 1970's an area of the Amazon, more than 3x the size of the UK has been destroyed.

Adaptations to the rainforest

Plants;

- Drip Tips
- Waxy leaves,
- Liana's and vines
- Buttress Roots

Animals;

- Nocturnal – energy saving
- Strong arms – climbing
- Camouflage – stay safe
- Able to swim - safety

Rainforest inhabitants

Many tribes have developed sustainable ways of survival. The rainforest provides inhabitants with...

- Food through hunting and gathering.
- Natural medicines from forest plants.
- Homes and boats from forest wood.

Issues related to biodiversity

Why are there high rates of biodiversity?

- * Warm and wet climate encourages a wide range of vegetation to grow.
- * There is rapid recycling of nutrients to speed plant growth.
- * Most of the rainforest is untouched.

Main issues with biodiversity decline

- * Keystone species (a species that are important of other species) are extremely important in the rainforest ecosystem. Humans are threatening these vital components.
- * Decline in species could cause tribes being unable to survive.
- * Plants & animals may become extinct.
- * Key medical plants may become extinct.

Impacts of deforestation

Economic development

- + **Mining, farming and logging creates employment and tax income for government.**
- + **Products such as palm oil provide valuable income for countries.**
- **The loss of biodiversity will reduce tourism.**

Soil erosion

- **Once the land is exposed by deforestation, the soil is more vulnerable to rain.**
- **With no roots to bind soil together, soil can easily wash away.**

Climate Change

- **When rainforests are cut down, the climate becomes drier.**
- **Trees are carbon 'sinks'. With greater deforestation comes more greenhouse emissions in the atmosphere.**
- **When trees are burnt, they release more carbon in the atmosphere. This will enhance the greenhouse effect.**

What are the causes of deforestation?

Logging

- Biggest cause of deforestation
- Timber is harvested to create commercial items such as furniture and paper.
- Violent confrontation between indigenous tribes and logging companies.

Mineral Extraction

- Precious metals are found in the rainforest.
- Areas mined can experience soil and water contamination.
- Indigenous people are becoming displaced from their land due to roads being built to transport products.

Energy Development

- The high rainfall creates ideal conditions for hydro-electric power (HEP).
- The Belo Monte Dam on the Xingu river is key for creating energy BUT it flooded 45,500 hectares of forest affecting people and the environment.

Sustainability for the Rainforest

Uncontrolled and unchecked exploitation can cause irreversible damage such as loss of biodiversity, soil erosion and climate change.

Possible strategies include:

- Agro-forestry - Growing trees and crops at the same time. It prevents soil erosion and the crops benefit from the nutrients.
- Selective logging - Trees are only felled when they reach a specific height.
- Education - Ensuring those people understand the consequences of deforestation
- Afforestation - If trees are cut down, they are replaced.
- Forest reserves - Areas protected from exploitation.
- International agreements - introduce reserves and protected areas
- Ecotourism - tourism that promotes the environments & conservation

Agriculture

- Large scale 'slash and burn' of land for ranches and palm oil.
- Increases carbon emission.
- River pollution & soil erosion increases due to the large areas of exposed land.
- Intensive farming is making the soil infertile.

Tourism

- Mass tourism is resulting in the building of hotels in extremely vulnerable areas.
- Lead to negative relationship between the government and indigenous tribes
- Tourism has exposed animals to human diseases.

Road Building

- Roads are needed to bring supplies, provide access to new mining areas, settlements and energy projects
- Logging companies use roads for heavy machinery and to transport wood. – built the Trans Amazonian Highway.



Cold Environments, Svalbard, NORWAY

Svalbard is a group of Norwegian Islands in the Arctic Ocean. 60% of Svalbard is a Polar Biome, 40% is a Tundra Biome.

Distribution of the world's cold environments

Most of the Worlds Cold Environments are found in or close to the Poles. Polar environments are closest to the North/South Poles. Tundra is found between the Arctic Circle and 60-70° North



Major characteristics of cold environments

Polar – low precipitation, -50° in winter, permanently frozen
Tundra – More precipitation but mainly snow, -20° during winter, brief summers

Svalbard inhabitants

- Population of Svalbard is 2,700 people
- Most of the people live in the main town of Longyearbyen
- There are more snowmobiles and polar bears than people!

Climate of Svalbard

- Very little precipitation with less than 200 mm per year – although there is more in the coastal areas
- Most precipitation comes in form of Snow
- Winter temperatures drop as low as -20°C
- Summers are brief but warm



Adaptations to the cold environments

Bearberry

- Low growing to survive strong winds
- Thick bark and hairy stems to retain heat and protect from wind
- Smaller, leathery leaves to retain water in dry environment
- Bright berries to attract animals and allow plants to spread

Polar Bears

- Thick fat layer – retain heat
- Large feet for walking on snow.
- Long, thick fur coat with hollow hairs to protect from the cold

More polar bears adaptations

Other adaptations that polar bears have evolved to cope with conditions in the harsh polar environment include:



Opportunities and challenges in cold environments - Svalbard

Opportunities	Challenges
<ul style="list-style-type: none"> • Energy resources such as coal can be found on Svalbard and oil has been around its coast – 300 people work in the coal mines • Potential use of Geo-thermal energy. Longyearbyen has a power station using coal from the mine – it employs 300 people on Svalbard. • Seas around Svalbard are rich fishing grounds for commercial fishing. – 150 species of fish. • Tourism brings in 70,000 visitors per year – 30,000 come on cruises so the Harbour has been developed. It employs around 300 people. • Tourist activities = kayaking, snowmobile driving, hiking, northern lights 	<ul style="list-style-type: none"> • The extreme cold makes working outside challenging and dangerous • Svalbard is remote and can only be reached by plane or ship. Longyearbyen has an airport with flights from Norway and Russia. • Most travel around the islands is done by boat and snowmobile • Buildings have to be very well insulated – the frozen ground is good for foundations BUT building can cause permafrost to thaw and be damaged. • Roads are mainly made of gravel raised above the ground to protect the permafrost • Water and sanitation pipes etc need to be insulated and above ground for the same reason.

The Fragile Cold Environment

- Mining can cause pollution and damage to the environment
- Tundra is damaged by vehicles and snowmobile driving – it takes YEARS to recover from this damage
- All construction can damage the permafrost and building can only really take place during the summer months
- Over-fishing can damage the ecosystem and cause problems for the people it employ

Protection

Protection of these cold environments is vital. Governments need to ensure they are protecting places like Svalbard as well as letting them develop.