

What is an Ecosystem?

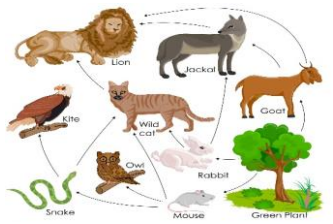
An ecosystem is a system in which organisms interact with each other and with their environment.

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.

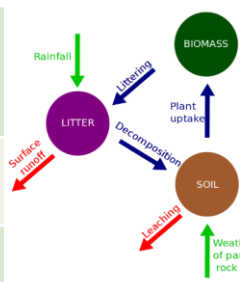


Food Web and Chains

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**.

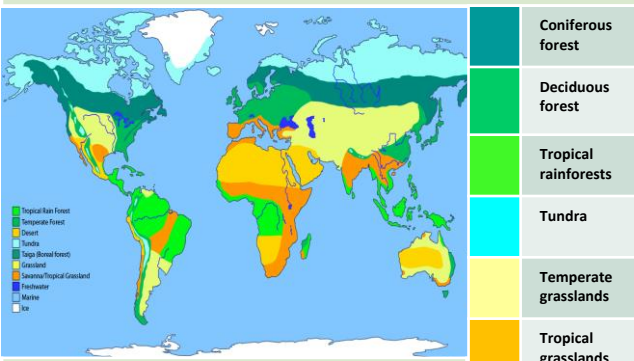


Litter This is the **surface layer** of vegetation, which over time breaks down to become **humus**.

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.



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 hoofed 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 (500-1500m /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.

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.

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)**.

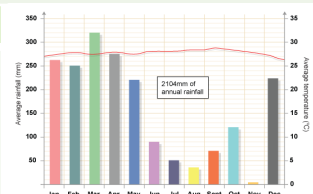
Components & Interrelationships

Season	Flora	Management
Spring	Flowering plants (producers) such as bluebells store nutrients to be eaten by consumers later.	- Epping has been managed for centuries. - Currently now used for recreation and conservation .
Summer	Broad tree leaves grow quickly to maximise photosynthesis .	- Visitors pick fruit and berries, helping to disperse seeds .
Autumn	Trees shed leaves to conserve energy due to sunlight hours decreasing.	- Trees cut down to encourage new growth for timber .
Winter	Bacteria decompose the leaf litter, releasing the nutrients into the soil.	

Layers of the Rainforest



Layer	Description
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 .



Tropical Rainforests: Belo Monte Dam Brazilian Amazon

Brazil is an NEE in South America. 60% of Brazil is a tropical rainforest but between 2000-2012 30 million hectares have been deforested, although the rate of deforestation is declining

Adaptations to the rainforest

- Spider Monkey** - Long arms and flexible grabbing tail to swing & support in the tree canopy.
- Drip Tips** - Allows heavy rain to **run off leaves easily**.
- Buttress roots** - wide strong shallow roots designed to support emergent trees.

Rainforest inhabitants

Many tribes, like the Jamuna, 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**, like **vincristine for blood cancers**.

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

Most widely reported cause of destructions to biodiversity. Timber is harvested to create **commercial items** such as furniture and paper.

Violent confrontation between indigenous tribes and logging companies.

Mineral Extraction

Largest iron ore mine in the world in the Carajas mine

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 Belo Monte on the River Xingu will generate 15% of the energy reducing CO2

Zebra Pleco is now extinct

New aluminium factories will develop, reducing the development gap.

20, 000 people from Altamira will be flooded out of their homes

Methane will build up from the rotting vegetation in the reservoir

Sustainability for the Rainforest

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

- International Agreements:** FSC protects 10% of all forests globally
- 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 particular height.
- Education** - Ensuring those people understand the consequences of deforestation
- Debt reduction** so countries do not need to exploit rainforests
- Ecotourism** - tourism that promotes the environments & conservation

Cattle ranching

Large scale **'slash and burn'** of land for ranches and palm oil. Increases **carbon emission**.

River saltation and soil erosion increasing due to the large areas of **exposed land**.

Cattle ranching accounts for 80% of deforestation in Brazil

Tourism

Mass tourism is resulting in the building of hotels in extremely **vulnerable areas**. Lead to **negative relationship** between the government and indigenous tribes

Road Building

Roads are needed to bring supplies and **provide access** to new mining areas, settlements and energy projects.

The Trans-amazon highway encourages logging and exporting of teak and mahogany

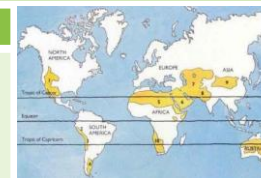
Hot Desert: Case Study Western desert USA



The western desert is located in SW USA and covers UTAH, Arizona, Nevada and parts of new Mexico. Las Vegas, in Nevada is the 2nd fastest growing city in the USA

Distribution of the world's hot deserts

Most of the world's hot deserts are found in the **subtropics between 20 degrees and 30 degrees north & south** of the Equator. The **Tropics of Cancer and Capricorn** run through most of the world's major deserts.



Major characteristics of hot deserts

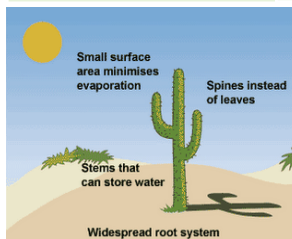
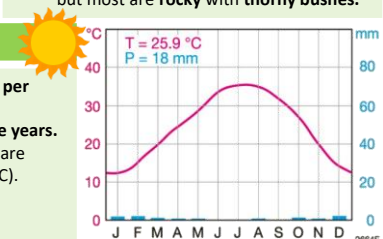
- Aridity** – hot deserts are extremely dry, with annual rainfall below **250 mm**.
- Heat** – hot deserts rise over **40 degrees**.
- Landscapes** – Some places have dunes, but most are **rocky with thorny bushes**.

Hot Deserts inhabitants

- People often live in large **open tents to keep cool**.
- Food is often **cooked slowly** in the **warm sandy soil**.
- **Head scarves** are worn by men to provide **protection from the Sun**.

Climate of Hot Deserts

- Very little rainfall** with less than **250 mm per year**.
- It might only **rain once every two to three years**.
- Temperate are **hot in the day** (45 °C) but are **cold at night** due to little cloud cover (5 °C).
- In winter, deserts can sometimes receive occasional frost and snow.



Adaptations to the desert

Cactus

- Large roots** to absorb water soon after rainfall.
- Needles** instead of leaves to reduce surface area and therefore **transpiration**.

Camels

- Hump for storing **fat (NOT water)**.
- Wide feet** for walking on sand.
- Long eyelashes** to protect from sand.

Desert Interdependence

Different parts of the hot desert ecosystem are **closely linked together and depend on each other**, especially in such a harsh environment.

Opportunities and challenges in the Hot desert

Opportunities

- There are **valuable minerals for industries and construction like copper**.
- Sonoran energy project produces enough electricity for 400,000 households**.
- Las Vegas has 40 million tourists a year worth \$9.7bn in 2013**
- \$375 million was spent by desert tourists outside of Las Vegas in 2013**
- Lake mead provides 90% of Las Vegas's water**

Challenges

- The extreme heat makes it difficult to work outside for very long**.
- High evaporation rates from irrigation canals and farmland**.
- Water supplies are limited, creating problems for the increasing number of people moving into area**.
- Access through the desert is tricky as roads are difficult to build and maintain**.

Causes of Desertification

Desertification means the turning of semi-arid areas (or drylands) into deserts.

Fuel Wood

People rely on wood for fuel. This removal of trees causes the soil to be exposed.

Over-Cultivation

If crops are grown in the same areas too often, nutrients in the soil will be used up causing soil erosion.

Climate Change

Reduce rainfall and rising temperatures have meant less water for plants.

Overgrazing

Too many animals mean plants are eaten faster than they can grow back. Causing soil erosion.

Population Growth

A growing population puts pressure on the land leading to more deforestation, overgrazing and over-cultivation.

Strategies to reduce Desertification

Great green wall stretching from Senegal to Ethiopia, 7000km long and 15km wide, planting acacia trees which reduces soil erosion, increases shade, increases moisture reduces migration and allows for sustainable small scale agriculture.

Stone Lines: using appropriate technology to stop water running over the surface, instead water and organic material is collected behind the lines increasing the fertility of the soil and reducing desertification