

## What is an Ecosystem?

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

## Ecosystem's Components

**Abiotic** Non-living parts, such as air, water, heat and rock.

**Biotic** Living parts, such as plants and animals.

**Flora** Plant life occurring in a particular region.

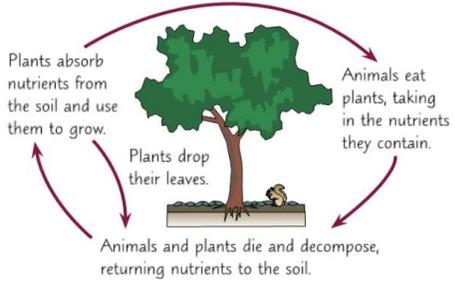
**Fauna** Animal life of a particular region.



## Food Web and Chains

**Food chains** are simple lines showing the links between producers and consumers. **Food webs** consist of many food chains connected together, showing a more detailed picture.

## Nutrient cycle

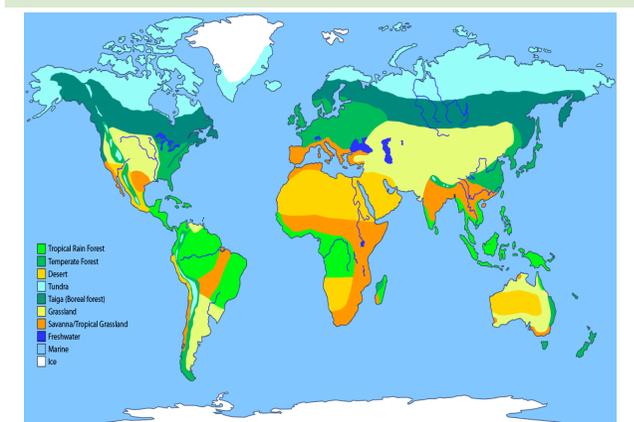


## Key words

**Biomass** = living plants and animals  
**Litter** = layer of decaying plant and animal material on top of the soil  
**Decomposers** = organisms that break down dead matter

## Global ecosystems

Large scale **global ecosystems (biomes)** are defined by the main type of vegetation that grows in that region. The types of plant and animals in a biome are mainly determined by the climate. The **most productive biomes** (with the **greatest biomass**) grow in climates that are **hot and wet**.



## Example UK Ecosystem: Avington Park lake, Winchester

Avington Park is located near to Winchester in Hampshire. It has a lake that is of historical and ecological importance. Lack of maintenance has led to many changes.

## Components & Interrelationships

**Silt and growth of vegetation** This created an excellent habitat for birds but blocked the views of the lake from the house and surrounding area.

**Restoration** The lake was restored in 2014. The aim was to preserve bird habitats and ensure that it is a visible part of the landscape.

**What was done?** Silt was removed and new waterside habitats were created to attract nesting birds and waterfowl.

**What was the impact?** The lake is now visible again and there has been a big increase in the wildlife diversity.

# Unit 1b The Living World



## 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**.

## 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-on effects** for the entire ecosystem.

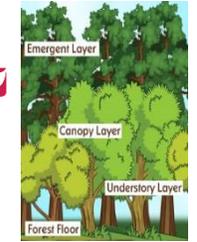
## Tropical Rainforest Biome

Tropical rainforest covers about **2%** of the Earth's surface yet they are home to **over half of the world's plant and animals**.



## 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.

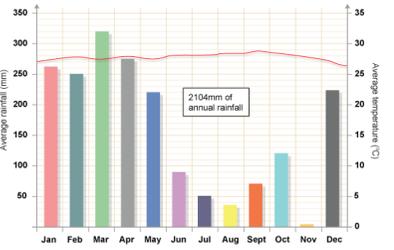


## Layers of the Rainforest

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

## 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.



Biome	Location	Temperature	Rainfall	Flora (plants)	Fauna (animals)
<b>Coniferous forest</b>	Between 50-60° N	Cold winters (as low as -40°C), mild summers (~10°C)	Variable, typically 300 - 900 mm	Evergreen coniferous trees with needles, fir and pine.	Varied, mammals such as wolves, deer, reindeer and moose.
<b>Deciduous forest</b>	Between 40-50° N	Warm summers + mild winters (5-20°C)	Variable rainfall (500-1500mm /year)	Mainly deciduous trees; a variety of species.	Mammals such as deer and fox are common, range of birds such as owls, hawks and woodpeckers.
<b>Tropical rainforests</b>	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
<b>Tundra</b>	Around 60-70° N	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.
<b>Temperate grasslands</b>	Mainly 40-45° N	Mostly hot (average of 24°C).	Usually dry, with a wet rainy season with thunderstorms	Mainly grasses, few trees.	Large herds of grazing animals with predators like lions and leopards.
<b>Tropical grasslands</b>	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.
<b>Hot deserts.</b>	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.

## Tropical Rainforests Case Study: Malaysia



Malaysia is a LIC country in south-east Asia. 67% of Malaysia is a tropical rainforest with 18% of it not being interfered with. However, Malaysia has the fastest rate of deforestation compared to anywhere in the world

### Adaptations to the rainforest

<b>Orangutans</b>	Large arms to swing & support in the tree canopy.
<b>Drip Tips</b>	Allows heavy rain to <b>run off leaves easily</b> .
<b>Lianas &amp; Vines</b>	Climbs trees to reach sunlight at canopy.

### 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

- Most widely reported cause of destruction to biodiversity.
- Timber is harvested to create **commercial items** such as furniture and paper.
- **Violent confrontations** 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 **Bakun Dam** in Malaysia is key for energy production in this country, however, people and environment have suffered as rainforest was cleared.

### 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 particular height/age.
- **Education** - Ensuring those people understand the consequences of deforestation.
- **Replanting** - If trees are cut down, they are replaced.
- **Forest reserves** - Areas protected from exploitation.
- **Ecotourism** - tourism that promotes the environments & conservation.

#### Agriculture

- Large scale '**slash and burn**' of land for ranches and palm oil.
- Increases **carbon emissions**.
- **River saltation and soil erosion** increase due to the large areas of **exposed land**.
- Increase in growing **palms for oil** is making the **soil infertile**.

#### Tourism

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

#### Road Building

- **Roads** are needed to bring supplies and **provide access** to new mining areas, settlements and energy projects.
- In Malaysia, logging companies use an **extensive network of roads** for heavy machinery and to transport wood.

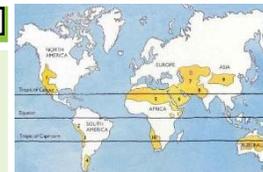
## Hot Desert Case Study: Thar Desert – India/Pakistan



The Thar Desert is located on the border between India and Pakistan in Southern Asia. With India soon becoming the most populated country in the world in the next five years. With this, more people will plan to live in the desert.

### 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

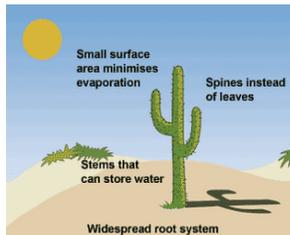
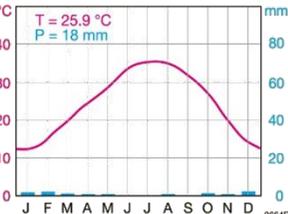
- **Aridity** – hot deserts are extremely dry, with annual rainfall below **250 mm**.
- **Heat** – hot deserts rise over **40 degrees**.
- **Landscapes** – Some places have dunes, but most are **rocky with thorny bushes**.

### 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**.
- Temperatures 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 a such a harsh environment.



## Opportunities and challenges in the Hot desert

### Opportunities

- **There are valuable minerals for industries and construction.**
- **Energy resources such as coal and oil can be found in the Thar desert.**
- **Great opportunities for renewable energy such as solar power at Bhali.**
- **Thar desert has attracted tourists, especially during festivals.**

### 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

- **Water management** - growing crops that don't need much water.
- **Tree Planting** - trees can act as windbreakers to protect the soil from wind and soil erosion.
- **Soil Management** - leaving areas of land to rest and recover lost nutrients.
- **Technology** – using less expensive, sustainable materials for people to maintain. i.e. sand fences, terraces to stabilise soil and solar cookers to reduce deforestation.