

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, 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 Chains

Food chains are useful in explaining the basic principles behind ecosystems. They show only one species at a particular level from where energy is transferred up to the next.

Nutrient cycle

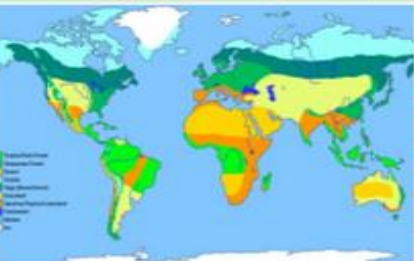
Plants take in those nutrients where they are built into new organic matter. Nutrients are taken up when animals eat plants and then returned to the soil when animals die and the body is broken down by decomposers.

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.

Tropical Rainforest Biome



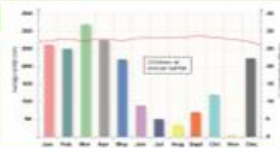
Distribution of Tropical Rainforests

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.



Convictional rainfall

- 1 The roots of plants take up water from the ground and the rain is **intercepted** as it falls.
- 2 As the rainforest heats up, the water evaporates into the atmosphere.
- 3 Finally, the water condenses and forms clouds to make the next day's rain.



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

Topic 4

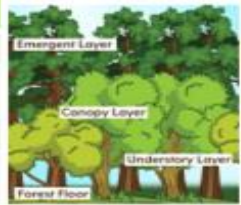
Sustaining Ecosystems

Interdependence in the rainforest

A rainforest works through interdependence. This is where the plants and animals depend on each other for survival.

Layers of the Rainforest

Emergent	Highest layer with tree reaching 50 metres.
Canopy	Most life is found here as it receives 70% of the sunlight and 80% of the light.
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 soil profile

Leaf Litter	Thin litter layer rapidly decomposes in heat.
Top Soil	Shallow topsoil is a mixture of decomposed organic matter and minerals.
Sub Soil	The sub-soil is deep due to weathering of rocks below.
Rock	Underlying rock weathers quickly at high temperatures to form sub-soil.

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.

Tropical Rainforest Biome

Adaptations to the rainforest		Rainforest inhabitants
Sloths	Are camouflaged to forest environment.	Many tribes have developed sustainable ways of survival, such as shifting cultivation. The forest provides inhabitants with... <ul style="list-style-type: none"> • Food through hunting and gathering. • Natural medicines from forest plants. • Homes and boats from forest wood.
Buttress Roots	Support tall trees & absorb nutrients.	
Drip Tips	Allows heavy rain to run off leaves easily	
Lianas & Vines	Climbs trees to reach sunlight at canopy.	

Effects of Human Activity on the Rainforest		Benefits of the rainforest	
Logging <ul style="list-style-type: none"> • Most widely reported cause of destructions to biodiversity. • Timber is harvested to create commercial items such as furniture and paper. • Has lead to violent confrontation between indigenous tribes and logging companies. 	Agriculture <ul style="list-style-type: none"> • 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 • Increase in palm oil is making the soil infertile. 	Raw Materials	Commonly used materials such as timber and rubber are found here.
		Water	Controls the flow of water to prevent floods/droughts regions..
		Food	Important foods such as bananas, pineapples and coffee are grown there.
Mineral Extraction <ul style="list-style-type: none"> • 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. 	Tourism <ul style="list-style-type: none"> • Mass tourism is resulting in the building of hotels in extremely vulnerable areas. • Has caused negative relationships between the government and tribes • Tourism has affected wildlife (apes) by exposing them to human diseases. 	Health	25% of modern medicines are sourced from rainforest ingredients.
		Energy	Large dams generate 2/3 of Brazil's energy needs.
		Climate	Acts as carbon sinks by storing 15% of carbon emissions.



Case study 8 - An ecosystem: management -Amazon Rainforest - NW Brazil



The importance of the vegetation

- Oxygen - photosynthesis-plants use sun's light energy to convert O₂ and CO₂ into glucose and oxygen -essential for animal/human life
- Trees store water -between periods of rainfall, so reducing the risk of river floods
- Roots help to stabilise the soil – preventing it from being eroded by heavy rain - especially in rainforest .
- Leaves - shelters soil from
 - i) drying out, crumbling & wind erosion.
 - ii) protects the soil from direct rainfall & soil erosion and decomposing leaves provide nutrients to the soil (nutrient cycle)
- Water cycle - transpiration from trees produces clouds and rainfall steady supply of clean water to rivers

Economic benefits of the tropical rainforest

- Providing natural materials such as timber , plants and drugs used in medicines, food stuffs such as honey, fruit and nuts. Has a huge bio-diversity -Plants and wild animals there may contain chemicals that might be useful to agriculture or medicine

Impact of human activity

- Trees are cut down to clear the land for mining(eg copper), farming,(cattle ranching or palm trees for bio-fuels), logging, building roads and settlements.

Positive impacts - Money can be earned for the area from selling timber, mineral deposits farming, cattle and palm oil for bio-fuels. Also transport is improved as more roads are built across the rainforest.

Negative impacts - as land is cleared, natural habitats are destroyed - creatures could become endangered/extinct, plants with curative powers could be destroyed before they have been tested, loss of soil by erosion, area becomes desertified as interfering with the water cycle and local climate, soil will lose its nutrients and become infertile.

How might the ecosystems be managed in a sustainable way?

Sustainable - the use of resources and environments in ways that benefit us but will allow them to be used in the future by future generations. Don't destroy them.

1. selective logging methods eg; animals not machines to pull out the trees-and a limit placed on number of trees/species of trees that can be cut down.
2. national parks - are set up to protect the forest and its wildlife
3. Bio-sphere reserves- where people are allowed to live, but only the tribes live in the centre where they can continue living their traditional way of life. settlements are only allowed around the edges.
4. medical reserves- large pharmaceutical companies buy up large areas to prevent them being destroyed. Look for cures for diseases.
5. animal corridors - plant trees to link up remaining patches of forest - animals can migrate between them
6. agro-forestry – local farmers grow suitable crops between and under the trees so land doesn't need to be cleared of trees but the farmers will have food to eat/sell
7. restrictions re the type of machinery that can be used in the forest
8. eco-tourism - Provides income from sustainable tourism