

## What is an ecosystem?

**Ecosystem** – a natural system made up of plants, animals and the environment.

**Local small-scale ecosystem** – local doesn't mean near where you live. It means small area. Examples include a pond, hedgerow or woodland.

**Global scale ecosystem** – occur in different places around the world e.g. tropical rainforest, tundra, hot deserts. These are called **biomes**.

**Producers** – Plants can turn sunlight into sugars through the process of **photosynthesis**.

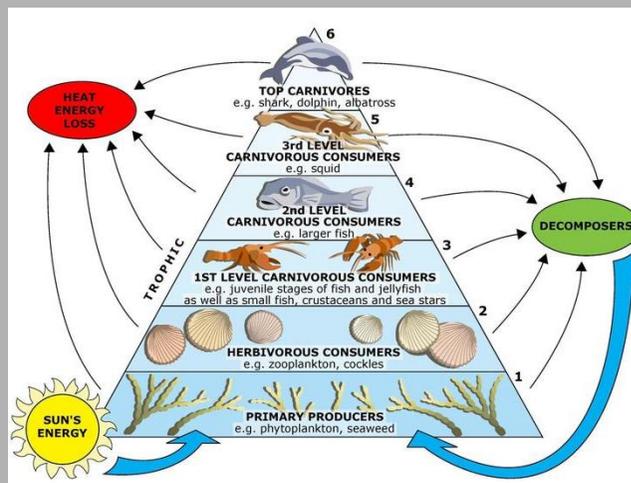
**Consumers** – They get their energy by eating a producer or another consumer e.g. pond snail eats pond weed

**Decomposer** – break down plant and animal material and return the nutrients to the soil e.g. fungi, bacteria

**Food chain** – shows the links between consumers and producers in the form of a simple line diagram

**Food web** – Shows all the complex links between consumers and producers.

**Trophic level** – Each stage in the food chain is called a trophic level. They form a trophic pyramid which shows how energy is lost at each stage and how the number of organisms goes down at each stage.



## Changes to ecosystems:

**Global-scale** e.g. climate change

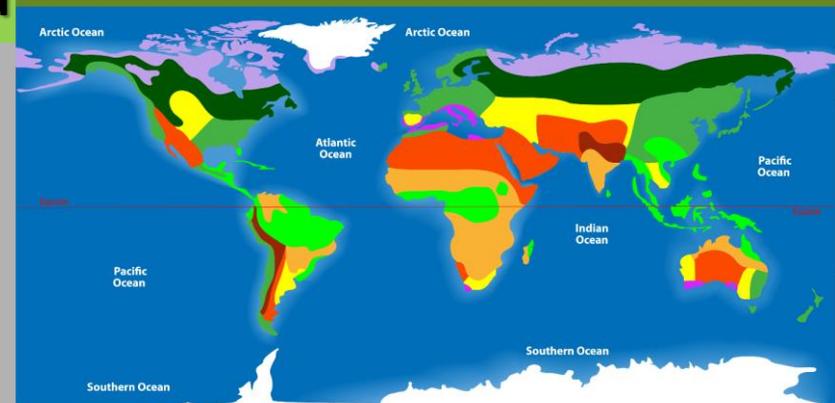
**Local-scale** e.g. changes to a habitat such as a hedge being removed.

**Natural changes** e.g. extreme weather events like drought or flooding.

**Change due to human activities** e.g. farming can damage ecosystems by adding fertilisers which causes eutrophication.

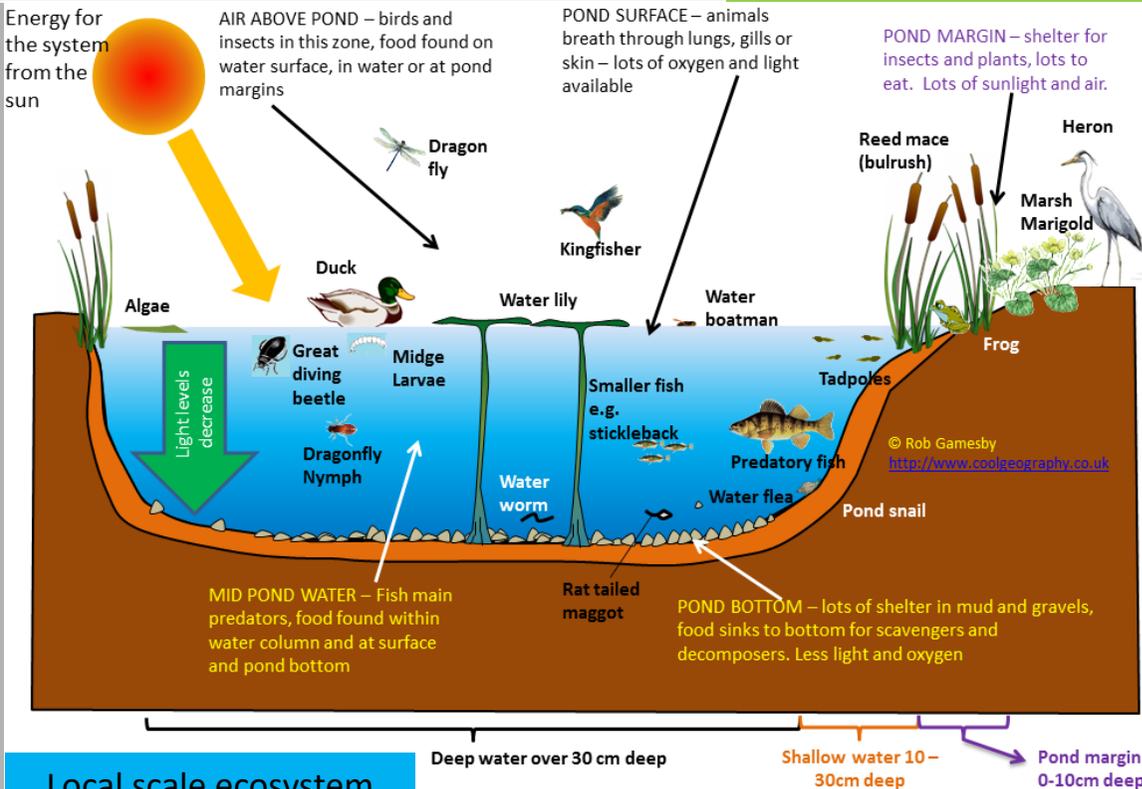
## The Living World

## The main biomes in the world



**The distribution of the biomes** – They form broad belts across the world from west to east, parallel to the lines of latitude. This is because they are linked to factors like ocean currents, winds, temperatures.

Altitude changes the pattern. For example, Mount Kenya is the highest point in Kenya. At the bottom of the mountain it is savanna and on the top there is a glacier called the Lewis Glacier.



## Local scale ecosystem

## What are the characteristics of tropical rainforests?

**CLIMATE** – They are found in places with an Equatorial (tropical) climate that is characterised by high rainfall (over 2000mm per year) and high temperatures (averaging about 27°C) throughout the year.

**Temperatures are high because** the Sun is directly overhead for most of the time.

**Rainfall is high because** global atmospheric circulation causes an area of low pressure to form at the Equator. The rising air creates clouds and triggers heavy rain

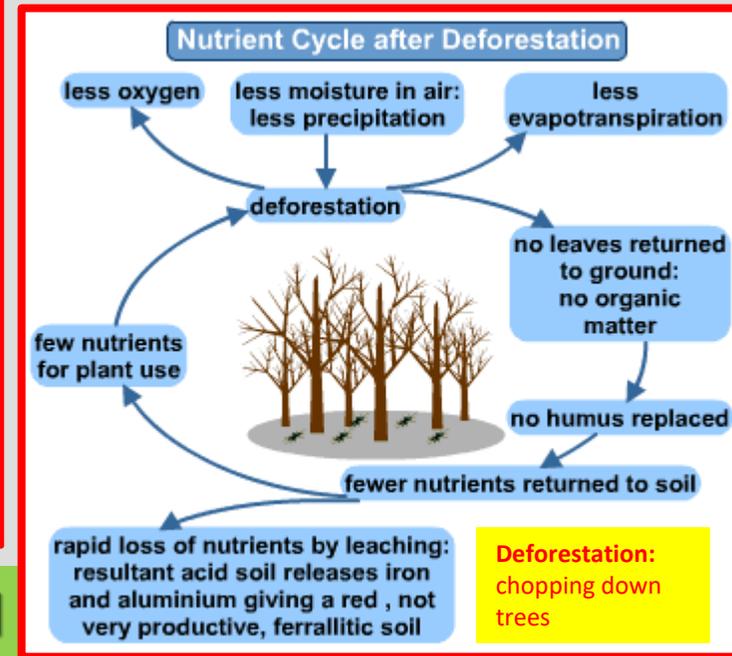
**SOILS** – Soils are thin and not very fertile. Most nutrients are found at the surface, where dead leaves decompose rapidly in the hot and humid conditions. Trees have shallow roots to absorb these nutrients. Fungi growing on the roots transfer nutrients straight from the air. This is an example of **nutrient cycling**. Heavy rainfall can quickly dissolve and carry away nutrients. This is called **leaching**.

**HIGH BIODIVERSITY** – Tropical rainforests support the largest number of species of any biome. Over half of all plant and animal species on Earth live on just 7% of the land surface.

Tropical rainforests are an example of a **carbon sink** – they absorb and store carbon dioxide. Carbon dioxide is one of the greenhouse gases, so tropical rainforests help to **protect us from climate change**. If trees are cut down and burnt this will add carbon dioxide to the atmosphere. **20% of the world's fresh water** comes from rainforests. They **stop the climate from becoming too dry**.

## Causes of deforestation in the Amazon rainforest

- ❖ subsistence farming – slash and burn to grow food for the family.
- ❖ commercial farming – plantations growing one crop for export e.g. soya; cattle ranching
- ❖ logging
- ❖ road building e.g. TransAmazonia Highway
- ❖ mineral extraction e.g. Carajas copper mine
- ❖ energy development e.g. Tucuruí dam
- ❖ settlement e.g. Manaus
- ❖ population growth: people from the shanty towns were given tools and a small sum of money to help them move.



## The Living World

### How are tropical rainforests adapted to the climate?

The way the rainforest is divided into four distinct layers is all due to the availability of light, which all plants need for the process of photosynthesis.

The **emergent trees** and those in the **canopy** receive most of the light and therefore grow tall.

Below the canopy, competition for sunlight is fierce. Trees in the **under-canopy** are shorter, as they are in the shade, but they are waiting for their chance to take advantage of the next light space to become available.

Only 1% of sunlight reaches the forest floor, so growth in the shrub layer is more limited.

### Economic gains

- Creates jobs
- Taxes paid to the government
- Better transport infrastructure
- Products e.g. palm oil
- H.E.P provides cheap electricity

### Economic losses

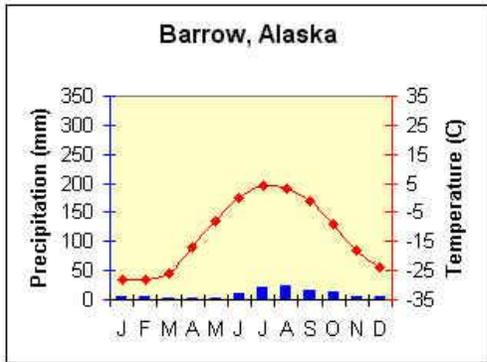
- Water pollution and drier climate causes water shortages
- Rising temperatures could stop us being able to grow some crops e.g. tea
- Fires
- Climate change causes expensive problems

### Strategies used to manage the rainforest sustainably in Costa Rica

- selective logging – remove trees that have already fallen using buffaloes to reduce soil erosion and damage to other trees
- National Parks – protected areas, conservation, education
- ecotourism
- international agreements – the FSC label is used on products from sustainably sourced timber
- debt reduction in return for agreeing not to deforest rainforests

**Polar environments** – These are found in inland areas, far from the warming influence of the sea. They include Greenland, Northern Canada, Northern Russia and Antarctica. Average monthly temperatures are always below freezing. Snow and ice build up over time. Most polar regions are partly or completely covered with ice caps.

**Tundra environments** – These are found south of the ice caps in the northern hemisphere. Most of the ground is permanently frozen. The landscape is treeless but has low-lying shrubs and mosses. They do not have snow cover all year round.



**Trans-Alaska pipeline**  
Pumping stations keep the oil moving. It goes under rivers. Raised and insulated. Cost US\$8 billion

**Development opportunities in Alaska**

**Commercial fishing in Prince William Sound**– Provides 78,500 jobs. Adds US\$6billion to Alaska’s economy. However, jobs are mostly just seasonal.

**Gold mining** – One fifth of the mineral wealth in Alaska comes from gold mining.

**Tourism** – Between 1 and 2 million visitors arrive in the summer. 60% are on cruise ships.

**Energy** – More than 50 H.E.P plants. Some geothermal energy has been exploited. More than 90% of the taxes raised by the Alaska state government come from the oil industry.



**Plant adaptations of Ellesmere Island in the Arctic**  
Algae grow inside the rocks to escape the dessicating effect of the wind. The Arctic poppy twists to catch the sunshine. The flowering plants all flower at the same time, when the snow melts in the summer. The Arctic Willow grows horizontally not vertically to escape the cold, drying wind. Lichens grow very slowly due to the low amount of sunshine for photosynthesis.

**Polar bear adaptations**  
Low surface area to volume ratio enables them to retain their heat. Translucent hairs with black skin so that the heat from the Sun can be absorbed. Claws help the bear to grip the ice. They have a highly developed sense of smell and they are good swimmers because there is very little food on land.

**Development challenges in Alaska**

- Snow and ice make some roads unusable for several months of the year.
- The upper layer of soil thaws and starts to slide down over the permafrost. This is called **solifluction**. It can cover roads.
- Permafrost melts in the summer, making routes waterlogged and impossible to use.
- The seasonal melting and re-freezing creates uneven ground called **themokarst**.
- **Frost heave** – where pebbles and stones slowly rise to the surface – makes travel and farming difficult.

**Oil production in Prudhoe Bay, Alaska**

Creates 2,000 jobs – but only 400 local people employed. All the rest is migrant workforce. Helps US energy security

**The Living World**

**Abiotic** – the part of the environment that is not living but affects the organisms e.g. soil, water and sunlight

**Strategies used to manage cold environments sustainably – The Antarctic Treaty System - Signed by 52 countries.**

- It can only be used for peaceful purposes
- guarantees continued freedom to conduct scientific research
- promotes international scientific cooperation
- sets aside the potential for sovereignty disputes - no new or enlarged claims can be made
- nuclear explosions and the disposal of radioactive waste;

**It has some of the toughest environmental protection rules in the world. It is viewed as a success. Changes were made to specifically protect plants and animals and to put quotas on fishing.**

Drilling for oil is controversial because the tundra and polar environments are very fragile. In 1989 the Exxon Valdez oil tanker spilled 1.2 million barrels of oil and killed 5,000 sea otters.

**THE ARCTIC**

Average Yearly Temperature: 0°C

Animals! The Arctic is at the top of the Earth (North!)  
Polar Bears live in the Arctic and love to eat Seals!  
Penguins do not live in the Arctic!

People & Population: 2 Million native people call The Arctic 'home'!

**VS**

**ANTARCTICA**

Average Yearly Temperature: -50°C

The Antarctic is the coldest place on the Earth!  
Nope, none of these in Antarctica!  
Penguins do however live Antarctica!

Very few people live in Antarctica!