World biomes

Tropical rainforest

- Tropical rainforests grow in places that have an equatorial climate. The rainforest is the most luxuriant vegetation system in the world although its trees have had to adapt to the constant high temperatures, the heavy rainfall and the continuous growing season. Over one-third of the world's trees grow here.
- Although the trees are deciduous, the rainforest has an evergreen appearance as the continuous growing season allows trees to shed their leaves at any time.
- Vegetation grows in distinct layers (Figure 14.8). The lowest layer consists of shrubs. Above this is the under canopy, the main canopy and, rising above, the emergents, which can grow to 50 metres in height. Trees have to grow rapidly in order to reach the life-giving sunlight.
- Tree trunks are straight and, in their lower parts, branchless in their efforts to grow tall.
- Large buttress roots stand above the ground to give support to the trees (Figure 14.9).
- Lianas, which are vine-like plants, use the large trees as a support in their efforts to reach the canopy and sunlight.
- As only about 1 per cent of the incoming sunlight reaches the forest floor, there is little undergrowth. Shrubs and other plants which grow here have had to adapt to the lack of light.
- During the wetter months, large areas of land near to the main rivers are flooded.
- Leaves have drip-tips to shed the heavy rainfall.
- Fallen leaves soon decay in the hot, wet climate.
- There are over 1000 different species of tree, including such hardwoods as mahogany, rosewood and greenheart.
- There is dense undergrowth near rivers and in forest clearings where sunlight is able to penetrate the canopy.

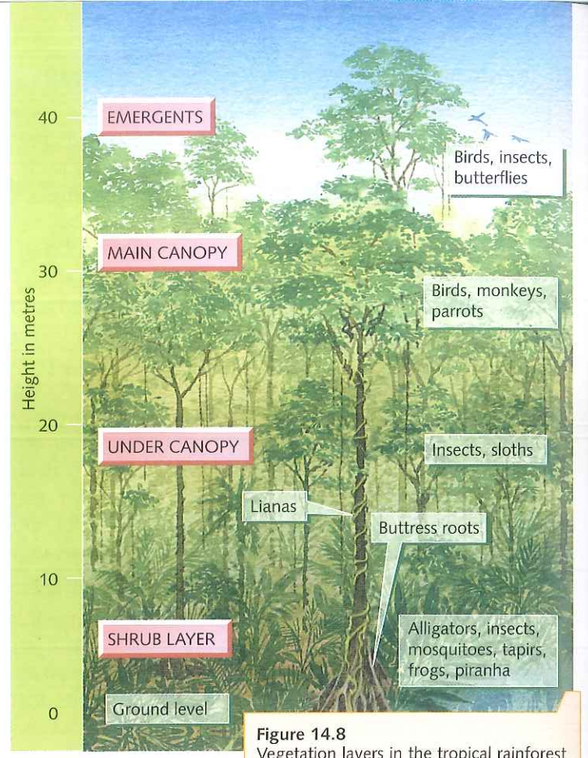


Figure 14.8
Vegetation layers in the tropical rainforest

Despite its luxuriant appearance, the rainforest is a fragile environment whose existence relies on the rapid and unbroken recycling of nutrients (Figure 14.10). Once the forest is cleared (deforestation page 236), then the nutrient cycle is broken. Humus is not replaced and the underlying soils soon become infertile and eroded. Not only is the rainforest unable to re-establish itself, but the land becomes too poor to be used for farming (page 237).

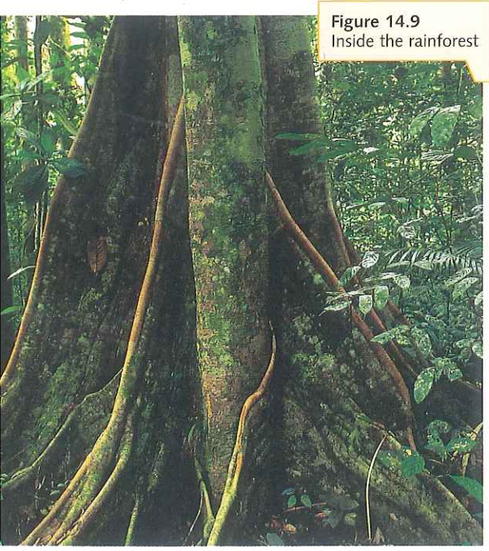
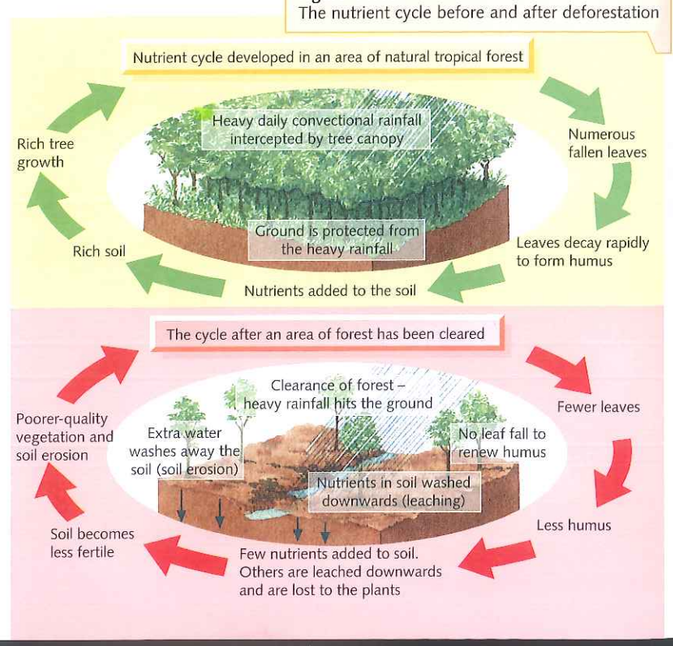


Figure 14.9
Inside the rainforest

Figure 14.10
The nutrient cycle before and after deforestation



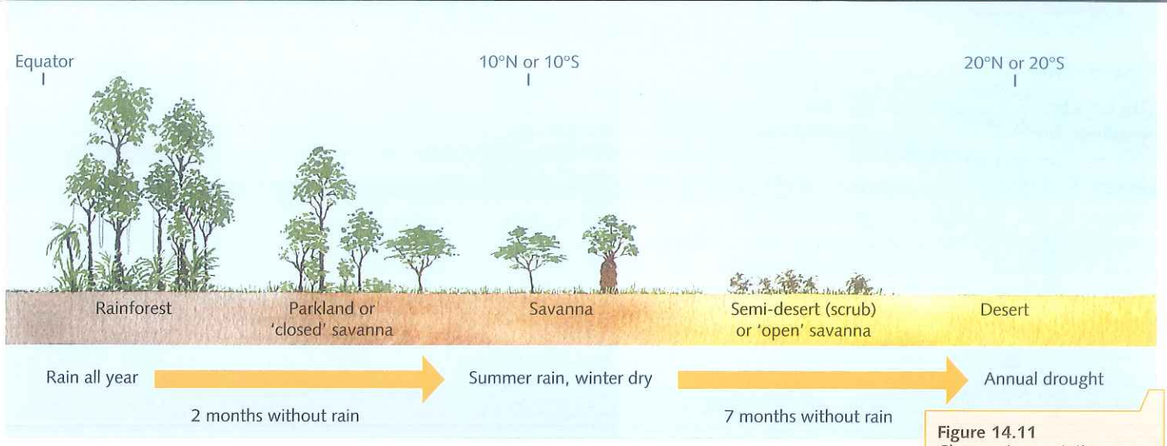
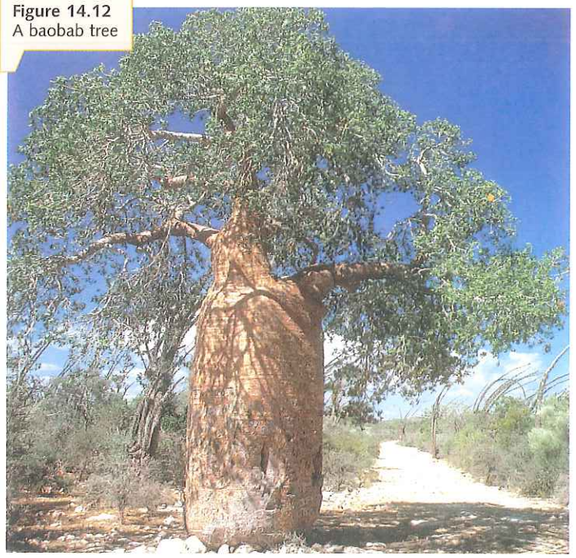


Figure 14.11
Changes in vegetation across the savanna grassland

Tropical savanna grassland

A transect (section) across the savanna grasslands shows how the natural vegetation changes in response to the climate (Figure 14.11). Where the savanna merges with the tropical rainforest (rain all year), the vegetation is dense woodland with patches of tall grass. Moving away from these margins, the vegetation slowly changes to typical savanna grasslands with scattered trees (rain for half the year), and eventually to the drought-resistant bushes and odd clumps of grass on the desert margins (hardly any rain).

Figure 14.12
A baobab tree



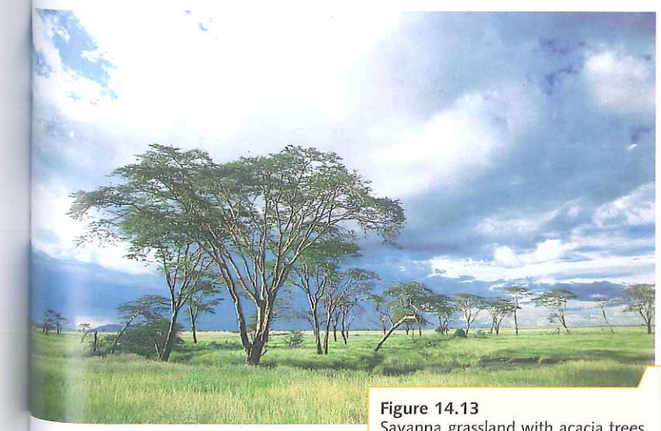


Figure 14.13
Savanna grassland with acacia trees

The dry season

The scattered deciduous trees lose their leaves, grasses turn yellow and dry up, and the ground assumes a dusty, reddish-brown colour. Some trees shed their leaves while others produce thin, waxy and even thornlike leaves to try to keep transpiration to a minimum. Most plants are **xerophytic** (drought-resistant) with very long roots to tap underground water supplies or with thick bark to store water in the trunk, like the baobab tree (Figure 14.12). Grasses grow in tufts, separated by patches of bare soil. As the dry season progresses, their stalks become stiff, yellow and straw-like and, in time, the plants wither.

The wet season

After the first rains, the grass seeds germinate and trees produce new leaves. Under the hot, wet conditions the grasses grow quickly and can reach a height of 3–4 metres before flowering and producing new seeds. The seemingly endless plains of the Serengeti (Tanzania) and Maasai Mara (Kenya) resemble a vast green sea occasionally interrupted by acacia trees (Figure 14.13). The acacias, with their crowns flattened by the trade winds, provide welcome shelter for wildlife.

The vegetation of these areas has been altered over a period of time by fire, either started deliberately or as a result of electrical storms. More recently, areas nearer the desert margins have experienced desertification (Case Study 15) mainly from pressures resulting from rapid population growth. Trees and shrubs have been removed for fuelwood. As settlements and cultivated areas increase, many nomadic herders, like the Fulani in West Africa and the Maasai in East Africa, find their traditional grazing grounds reduced in size. This leads to overgrazing and soil erosion in the areas to which they are restricted.

Hot desert

The vegetation that grows in hot desert areas has to be able to withstand exceptionally high temperatures, long periods without any rainfall and, often, ground salinity. Few desert areas are totally without vegetation but, equally, none has a complete covering (Figure 14.14). Vegetation has had to adapt to the harsh conditions in the following ways:

- Plants, like the cactus, have thick, waxy skins to reduce the loss of moisture through transpiration, and fleshy stems that can store water (Figure 14.16).
- Many plants, such as the cactus and thornbush, have thin, spiky or glossy leaves which also reduce transpiration (Figure 14.16a).
- Most plants have either very long tap roots which enable them to reach deep down to underground supplies of water (acacias), or shallow roots that spread out over a wide area to allow them to make full use of any rain that falls (creosote bush).
- Seeds have the ability to lie dormant for several years and then to germinate quickly after a heavy shower and to complete their life cycle within two or three weeks. When these plants flower, the desert literally blooms, the bright flowers attracting insects to help with pollination (Figure 14.15).
- Many plants are also capable of growing in saline depressions where water collects following the short but heavy showers before rapidly evaporating to leave deposits of salt.
- Plants tend to be widely spaced so as to reduce competition for water (Figure 14.14).

Human impact on the desert biome has been fairly limited, partly due to the lack of commercial plants, other than the date palm, that grow there. Nevertheless, it is a fragile ecosystem which can be subject to an increased risk of desertification, especially in places where there is a growth in population (Case Study 15).

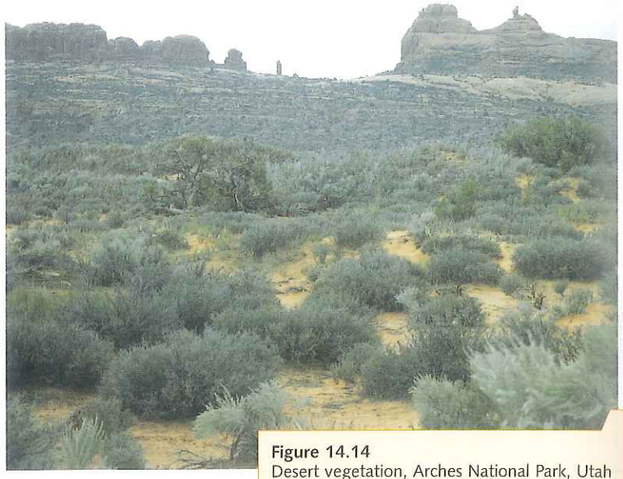


Figure 14.14
Desert vegetation, Arches National Park, Utah

Figure 14.15
The desert in bloom

a

b

Figure 14.16
Cacti
(a) prickly pear (b) saguaro

Coniferous forest

The natural vegetation of the coniferous forest, or *taiga* as it is known in Russia, consists of vast uninterrupted stands of spruce, pine and fir (Figure 14.17). The most common trees are the Norwegian spruce and Scots pine in upland Britain and Scandinavia, and the Sitka spruce and Douglas fir in North America. Often, in contrast to deciduous woodlands, only one or two species of tree grow across a wide area. The trees have had to adapt to the harsh physical environment (Figure 14.18) where:

- winters are long and extremely cold, often with strong winds; precipitation falls as snow and, as groundwater is frozen, moisture is unavailable for plants
- summers are cool and the growing season is short, but there is some rain for plant growth
- soils are often thin and poor (see podsols, page 253).

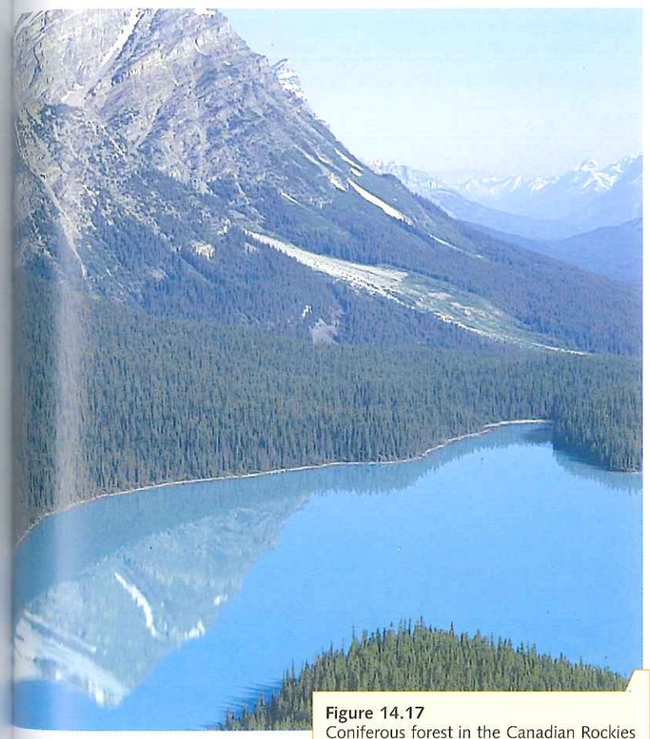


Figure 14.17
Coniferous forest in the Canadian Rockies

Coniferous trees are softwoods. They are valuable for timber, as well as for pulp and paper. The coniferous forest, covering as it does vast tracts of mainly inhospitable land, has been less affected by human activity than have most other biomes.

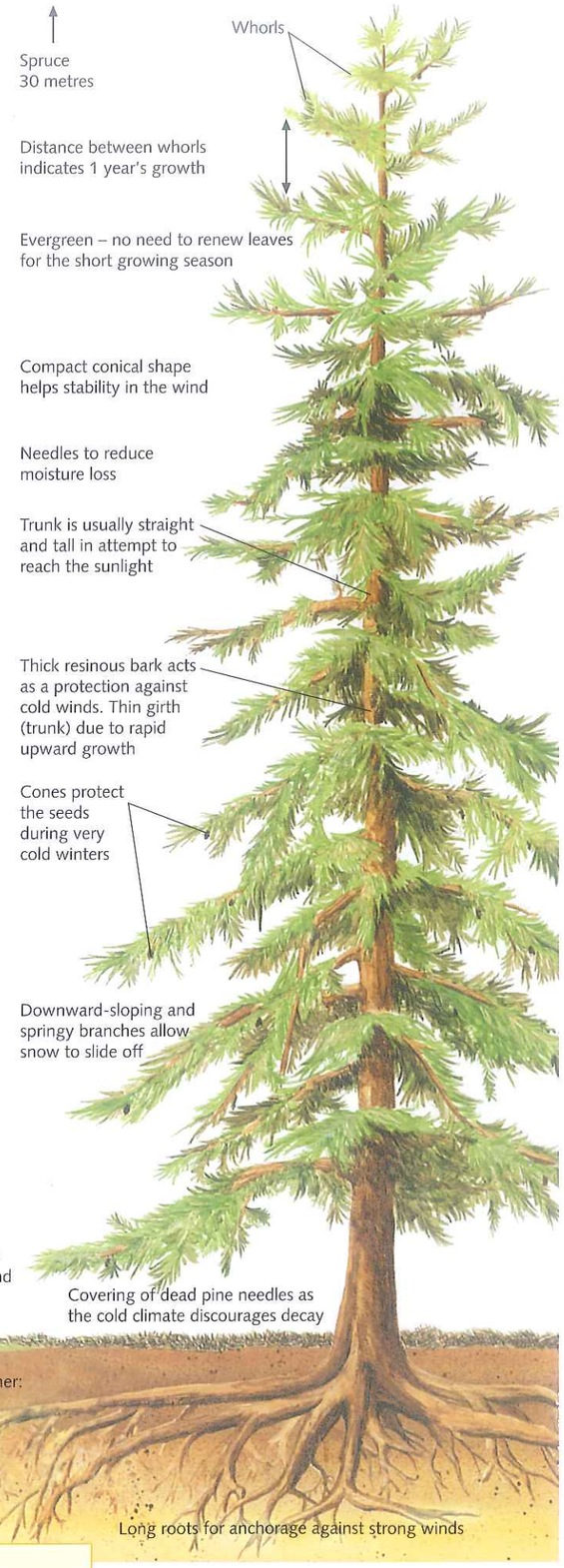


Figure 14.18
Adaptation of conifers to cold climates