

Temperate forest

Introduction

The areas in the middle latitudes are characterized by four distinct seasons: the temperature is neither too high nor too low and the rains are well distributed around the year. In these areas forests can grow, however human activities are progressively cutting them. In a mixed forest, in autumn, a burst of colours comes alight: from the green leaves of the evergreens to the browns, yellows, oranges and reds of the deciduous trees. The fallen leaves add nutrient substances to the ground, and in spring, before the new leaves bud, there is enough light for flowers to bloom.

Temperate forest biome

Deciduous forest

South of the taiga is the broad-leaved temperate forest or deciduous forest, occupying large part of Europe, China and the United States, i.e. approximately 5% of the lands above sea level. The adjective 'deciduous' comes from the Latin *cadere* and refers to the fact that leaves fall off these plants during the cold season. In these areas, temperatures differ remarkably from one season to the other: warm and wet in summer and cold in winter. Leaves fall in winter to avoid a useless loss of water through transpiration.

As to the climate, the rainfall here is approximately 300-1200 mm, steadily falling all through the year: there is no dry season. Summer generally lasts 4 to 6 months, and is very fertile for the vegetation, while in winter most plants stop growing. Winters are however much milder than at higher latitudes: even in the coldest days the daily minima never drop below -2°C .

Temperate forests in the world

Deciduous temperate forests can almost only be found in the boreal hemisphere, in which three main areas can be distinguished. In Europe, the deciduous and mixed forest area extends from the British islands to France and to all Central and Eastern Europe through to the Urals; in eastern Asia, they are spread in the far east of Russia, in Manchuria, Korea and Japan; in north America they occupy a large part of the area between the Great Lakes, the Atlantic Ocean and the Gulf of Mexico south. Although separated by thousands of kilometres, these deciduous forests are similar not only in the way they look, but also in the species of plants they are made of, even if with some differences depending on the geological history of these regions during and after the ice age.

Plants of the temperate forest

Unlike tropical forests, temperate forests have just two layers of vegetation. The tallest trees have their foliage generally about 15-30 m above ground and a layer of shrubs and smaller trees underneath, at approximately 5-10 m. This is why the soil receives more light than in tropical forests and the undergrowth is luxuriant: ferns, mosses and lichens, especially in very rainy areas.

During the spring growth, i.e. when the tree foliage has not completely formed yet, there is plenty of light reaching the ground and this makes plants grow on the ground. This is why many of the species that live on the ground grow, flower and bear fruits before late summer. Later on, sciophilous plants, i.e. plants that like shade, start to grow. These plants have extremely efficient mechanisms to capture and use low-intensity light and are able therefore to survive even when the foliage completely covers the soil underneath.

The main trees living in this biome are: beeches, sycamores, oaks, aspens, walnut trees, lime trees, chestnut trees, birches, elms and in America tulip trees.

The beech

Beeches (*Fagus sylvatica*) can reach up to 40 m tall and have a large, dome-shaped foliage. Their fruits, called beech

nuts, look like chestnut husks, but their thorns do not prick since they are softer and more rounded. They prefer clayey and airy soils, in wet areas, away from harsh winter frost. They are common in Central and Western Europe, where they are largely used to make timber. They are not only extremely useful (furniture, parks, railway sleepers, cellulose), but also commonly used as ornamental trees.

Sycamore

Sycamores (*Acer pseudoplatanus*) live essentially in hilly and mountainous northern woods only, up to 1800 m above sea level. They grow quickly, they like fresh and wet soils and can reach up to 25-30 mt tall.

Oak

Oaks (*Quercus* spp.) are trees or shrubs that can reach up to 40 mt tall. Oaks can live to 500 - 1000 years of age. Their fruits are elongated acorns, protected at the base by a cup-shaped shell. They are widespread in tropical mountain areas (Mexico, Himalaya, Indonesia), in Mediterranean climates (California, Mediterranean areas) and in temperate climates (North America, Asia, Europe). Oaks are used to make timber, stairs, parks, furniture, casks and railway sleepers.

Aspen

Aspens (*Populus tremula*) are medium-size trees than can reach up to 25 mt tall. They grow quickly. They like warm and sunny areas. They are scattered about Central Europe and rarer in Western Europe. They can be grown on uncultivated land to graft them quickly and for long. They are very resistant to industrial waste, and actually grow well in town.

Walnut tree

Walnut trees (*Juglas regia*) are large trees that can reach up to 20 mt tall. Their fruits are stone fruits (they are fleshy fruits, i.e. the ovary wall that envelops the seeds becomes juicy when mature) with a green fleshy part (husk), which, when dry, releases its woody stone (walnut) which contains an edible seed rich in fats. Walnut trees are widespread everywhere as fruit trees and for their precious timber which is used to make furniture; they are productively grown in temperate areas: the most important walnut producing country are the United States.

Lime tree

Lime trees (*Tilia cordata*) are beautiful, straight-trunk trees that can reach up to 30 metres tall. There are a variety of lime trees, one of the most common ones being the *Tilia platyphyllos*. Wild lime trees can be found in coppices, bushes, sunny slopes and rocks, along riverbanks in the mountain and submontane areas of Central Europe; it is rarer in Western Europe. Lime trees are often used to shade town streets, to decorate parks and gardens. For its look and scent, the ancient Greeks have always associated this plant to womanliness; they actually considered it as Aphrodite's favourite tree.

Chestnut tree

Chestnut trees (*Castanea sativa*) are big, 20-30 m tall trees. Their flowers are encased in a thorny "husk", which is first green, then turns brown-yellowish. Once fecundated, it produces the fruits, i.e. the chestnuts. More specifically, these fruits can be called chestnuts if each husk contains two or three fruits. If a husk produces only one fruit, then such fruit, which is very big and spheroid, is called 'marron'. Chestnuts ripen in autumn. Depending on the variety, some of which ripen earlier, some later, they can be eaten fresh from early September to early November.

Birch

Birches (*Betula pendula*) come from Europe and the south-east of Asia. They grow well in sandy and peaty soils. The genus takes its name from the Celtic betu. Silver birches are widespread in Europe, where they reach a latitude of 65° north and Sicily south. They love the sun, they grow alone or in small groups in hilly and mountainous sparse woods, along with broad-leaved and coniferous trees. In the wild state, they can grow even on dry and bare, preferably acid, soils, with enough water, and can tolerate the cold quite well. They are used as ornamental trees for their elegant deportment and the decorative colour of their bark and leaves.

Elm

Elms (*Ulmus carpiniifolia*) come from North-Africa, Europe and south-western Asia. They are Ulmaceae plants and can reach up to 30 m tall. Their foliage is hemispherical, their branches are thin and pale brown, their flowers are small and red. Their bark is grey-brown with deep furrows, their leaves are oval with a pointed end and a slanting base.

Tulip tree

Tulip trees (*Liriodendron tulipifera*) take their name from the fact their flowers are shaped like tulips. This species comes from the eastern part of North America and has been brought to our continent in the mid-17th century, when it was used as an ornamental tree for the beauty of its flowers and leaves and in Central Europe also to make timber. A heliophilus (that loves light), rural and long-living plant, it tolerates harsh cold quite well, but is very demanding when it comes to soil, that must be deep and fertile. The wood of the tulip-tree is pale yellow and is called "yellow poplar" because it looks like it; it is fairly good quality, woodworm-proof and can be used in a wide range of applications, especially in carpentry, to make furniture, music instruments, packages, panelling and in paper-making

Poplar grove

Exploiting natural woods is not enough to meet all demand, and trees have begun to be grown to make timber. Poplars are perfect to fulfil these purposes since in very few years (10 – 12) they grow very tall so that they can be used in many different ways (plywood, particle panels, cellulose paste, toothpicks, matches, etc.). While in the beginning native trees were used, now the trees used are hybrids selected for growth, wood quality, resistance to parasites and diseases. Poplar groves find their ideal location along the Po banks since they need plenty of light and soils that are fairly loose, airy and that can be irrigated. Man has to work at them at all the time so much so that poplar groves are regarded as a real cultivation, just like corn: land tilling, pesticide spraying and pruning. However plain and boring the sight is made by these orderly rows, they also offer a nesting place to magpies and carrion crows which are the birds best suited to live near urban settlements.

Animals of the temperate forest

Unlike tropical forests, this biome contains very few mammals, because there is no complex series of layers and the vegetation is seasonal.

During autumn, the animals of this biome feed on and lay in stores for the winter; in particular, they like walnuts and winged seeds which actually keep a long time.

The fruits of the apple-tree, the rose, the hawthorn, the gooseberry and others tend instead to ripen all at the same time (about late summer) and are used therefore during the summer to store fat.

Hibernation

Many mammals and birds have devised a number of strategies to survive the rigours of winter; many species sleep all through the winter, well protected in their dens. Some animals go into a real hibernation: their body temperature drops and their metabolism is reduced to a minimum: the stored fat is in any case sufficient to keep the animal alive; hedgehogs and mice do this. Hedgehogs (*Erinaceus europaeus*) are terricolous animals that build their nests on the surface, under shrubs and bushes; during the day, they hide under dry branches and leaves, while at dusk they go around, looking for food. Hedgehogs are the only insectivores to hibernate, generally from October to March. They feed on insects, earthworms and earth molluscs.

Squirrels, bears and badgers do not decrease instead the temperature of their bodies, but during the winter they get into a state of sleepiness alternated with short bursts of waking. In these periods, squirrels (*Sciurus vulgaris*) feed on the stores (walnuts and hazelnuts) they have laid in during the autumn. Squirrels are diurnal species that live almost only on trees, where they move very easily. They build individual nests, generally at the bifurcation of branches 5-15 metres above ground, made of woven twigs with one or two entrances. They feed on shoots, roots, scrub fruits, acorns, walnuts and hazelnuts. Sometimes, they eat insects and bird eggs as well.

Forest mammals

Brown bears

Brown bears (*Ursus arctos*) prefer forest environments, even if they adapt to a wide variety of habitats. In Italy, they only live on mountains which are largely covered with woods and have a steep morphology, since they keep away from those areas which are excessively disturbed by men. They tend to live in woods mainly in the spring and autumn, while in the

summer bears tend to stay in shrubby and grassy areas, at higher altitudes. During the winter, they prefer steep rocky areas, where they can find caves or at least gorges to dig out dens for hibernation. Brown bears live mainly, but not only, at night. They are territorial and solitary, and their social relations are limited to the mating season.

Badgers

Badgers (*Meles meles*) live in forests, plains and mountains up to 2,000 m asl. They prefer broad-leaved or mixed woods, even if small, alternated with open, shrubby, stony and uncultivated areas; in northern regions, they mainly live in coniferous forests. In any case, they are ecologically very adaptable, and this is why they can live even in farming areas and thick bushes, coasts included. They dig dens or use those of other animals (porcupines, foxes) with which they sometime cohabit. In northern Europe, badgers form social groups sharing the same den and territory, while in Italy they seem to prefer a more solitary lifestyle.

Other animals try to survive the winter with the little food they can find, also using the fat they have stored: deer and wild boars rummage amidst the vegetation and feed on bark and twigs; some birds feed on the shoots and berries that remain on trees, while insectivore birds root amidst the leaves in search of lethargic insects and earthworms, while tits look for them on branches.

Deer

Deer (*Cervus elaphus*) are generally associated with open woods, interspersed with expanses of open grassland in flat regions; only later were they pushed towards thick forests and mountains by man's pressure. At present, they live in a wide variety of habitats, from Scottish moors to mesophilic forests (consisting of plants that like wet areas) in central Europe, to the Mediterranean scrub of the southernmost part of its distributional area. On the mountains, during the summer they venture well beyond the upper limit of arboreal vegetation, in the open grasslands of the alpine horizon. In Italy, they prefer to live in broad-leaved or mixed woods alternated with large clearings and pastures, but can also be found in coniferous forests, in the riparian scrubs (i.e. located near river and lake banks) of water streams and, in Sardinia, in the typical Mediterranean scrub. Deer form large herds, generally headed by one older doe. In the mating season, stags have a deeply ritual behaviour, for instance fights, cries (powerful bells), marking of the territory. At the end of the mating season, stags go back to their solitary lives, while does remain in groups, headed by one adult doe. Deer live mainly at night and at dusk, they are very suspicious and keep away from everyone. They are a herbivore and browsing species (pastures, shrubs, ericaceous plants, conifers)

Birds in the forest

Some birds, including songbirds, migrate south after storing enough fat. These include goldfinches (*Carduelis carduelis*), which live almost everywhere in Europe, except Iceland, Norway, Finland, Sweden and northern Russia. They live in mixed woods, gardens and bushes located in open areas. They feed on aphids, shoots and seeds, especially thistle seeds. They build their nests 8-10 metres high on broad-leaved or coniferous branches; their nests have thick walls, often made of fibres, moss, wool. The females hatch the eggs, while both parents take care of the brood.

The history of forests

During the ice age, since there was no mountain ridge in north America to stop ice from moving forward (the main ridges, the Rocky Mountains and the Appalachian Mountains, run north to south), ice moved south, causing temperate forests to withdraw. In Europe, instead, the Alps and the Pyrenees prevented ice from moving forward, thus stopping forests from moving away from the north. Many species of plants could not spread too much because of the glaciers moving powerfully forward, and so they disappeared. Chinese forests were spared the advance of the ice and the consequences of the ice age, thus preserving even more vegetal species than Europe. Asian and European eastern forests must have formed an uninterrupted belt; even now both areas have some species of trees in common, for instance the Caucasian walnut tree, of which 8 varieties are now known in the world, of which 7 are in China and Japan and one in the extension towards the Caspian Sea of the biome of Iran's temperate forest. Before the ice age, this tree was widespread in all the deciduous forests of Europe, as is shown by the finding of fossil pollen. After the glaciations, the Caucasian walnut tree

became rare in the West, where it only survived in the deciduous forests of Iran, acting as a sort of connection with the flora of the temperate forests of the Far East.

Reintroducing deer

The area historically occupied by deer probably extended across most parts of peninsular Italy and Sardinia. Starting from the 17th century, the transformations in the environment, the growth of the human population and the intensification of hunting activities, caused the progressive disappearance of the species from increasingly vast sectors of the Italian territory. At the end of the 19th century, there was only a small population of deer in the Bosco della Mesola (the Mesola forest) near the delta of the river Po, and another in Sardinia. This situation continued practically up to the end of World War II, (approximately mid-20th century) except for a few more or less sporadic presences due to the immigration of some individual deer coming from Switzerland. This phenomenon of the expansion of the populations of deer from Switzerland, from Austria and from Slovenia to the southern slopes of the Italian Alps, became more constant and consistent starting from the 50s, and was responsible for the re-colonization in the Italian Alps, in the central and eastern sectors.

However, the situation was different in the case of deer in the western Alps and in the northern and central Apennines; here the presence of deer is due to repeated operations to reintroduce the deer, which were started at the end of the 60s. In Sardinia, instead, the deer disappeared from the central and northern regions in the 40s and only after the mid-80s did they become a topic of active management, which led to an increase in the populations and the area where they spread. At present the consistence of the species on the entire Italian territory can be estimated to be approximately 32,000 specimens.