

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.

Man and Temperate Forest

Wood and paper industry

Woodwork in Italy is an extremely old tradition which has been developing highly creative and top-quality products since the 16th century. Mainly developed as a craft, the real furniture-making industry was born between the Fifties and the Sixties. It was just over these two decades that the great strongholds of Italian furniture-making developed in Brianza, Triveneto, in the Pesaro area and in Tuscany.

In 1995, there were approximately 35,000 Italian furniture-making companies, employing 250,000 people and topping a turnover of approximately 30 billion euros, approximately 14,000 of which are made up by exports. Italy is the leading exporter of furniture and interior decoration in Europe. In just a few years, "made in Italy" furnishings have become sought after all over the world. A lot of timber is required to meet market requirements.

The paper-making industry also requires a lot of feedstock. Just think that the European Union is the second largest producer in the world (after the USA and Japan) and Italy is top of the list. In our country, paper and cardboard making reached 8.9 million tons in 2001.

Wooden musical instruments

Violins, cellos and contrabasses are built by luthiers. Their soundboxes are made of spruce and maple wood, while other parts of these instruments are made with such exotic trees as rosewood and ebony. Violins are made of more than 60 pieces each. But also many other orchestra instruments (for example wind instruments) are made of wood. To make a piano, fir, beech and lime wood is needed, for a total of 2 cube metres of wood.

Different types of firewood

Not all woods burn in the same way. Hornbeam wood is the one that supplies most heat as it burns; beech comes second. Oak is chosen instead to produce coals because it lasts longer. Wood from resinous trees heats faster, but not for as long.

Food from the forest

Forests have always been essential to man: as food, for industries and even for health. Oaks for instance is appreciated for its wood, which is very good quality and is sold at a high price to cabinetmakers and carpenters. Oak wood is used to make valuable furniture, veneers and often wine casks.

Plants used for food include walnut trees, which are also widely appreciated for the quality of their wood, which is used in high-quality carpentry, and chestnut trees.

Chestnuts trees, native to the Mediterranean regions, are generally grown for their fruits, the chestnuts, which are eaten cooked or ground into flour to make bread. Men have been feeding on chestnuts since time immemorial. Chestnut forests are also appreciated by hunters, since wild boars which eat chestnuts like to stay there. Chestnut wood is used in carpentry, as firewood and to make vineyards stakes that can stay planted for a long time without rotting. Chestnut wood can also keep away maggots and woodworms and is used therefore to protect linen.

Willows are mainly known for their healing properties: their bark for instance contains salicylic acid, commonly known as aspirin.

The forest, a disappearing resource

Healthy forests mean a healthy planet, because forests protect the catchment basins needed to supply freshwater and the soil from water and wind erosion, help to re-oxygenate air, provide shelter to plants and animals, food and fodder to mountain people, are a source of timber and other products. Despite this, forests are endangered. As early as the Middle Ages wood was a resource of primary importance since it was the only source of energy along with water. Later on, after the Industrial Revolution, forests remarkably dwindled, since this resource began to be used in many different ways: wood as a source of energy for forges (equipment where metal parts are hot-forged) and glassworks, to make railway sleepers at a time the railway network was extended for thousands of kilometres, to make new houses to cater for the increased population. The only ancient forests left are in eastern countries and in Russia. They are called “primary” and have never been exploited since they have always belonged to rich people who used them for hunting as well as often being hardly accessible. Today, the authorities are trying to control the forests that have been left in a way that enhances and protects their value. Many parks have been set up for this purpose, in which getting to know and appreciating forests helps the spreading of a more “environment-friendly” culture. In addition, the FAO has established a plan for the assessment of global forest resources. To put it in place, they had to resort to remote sensing and geographical mapping to monitor the conditions of the Planet’s ecosystems.

Eco-tourism

Tourism-related activities are the largest economical sector in the world, since they contribute either directly and indirectly to approximately 7% of the world’s production and offer thousands of jobs worldwide. For many countries, tourism is one of the greatest sources of work and income.

It is important, therefore, to raise people’s awareness of the disturbance tourists inevitably cause to the environment with which they interact, and to promote conscientious tourism, or eco-tourism. It can actually protect the natural wealth by finding how to minimise negative effects. The World Tourism Organisation, the United Nations and other international agencies have identified the main conditions that an ecotourism project has to fulfil:

- making sure it furthers the preservation and sustainable development of territories and neighbouring communities;
- ensuring the involvement of local communities in all stages of an ecotourism project;
- minimising the negative impact that accommodation, transport and any organised tourist activity may have on the natural and cultural environment;

- making sure a reasonable part of the income generated by tourism-related activities goes back to local communities and to the preservation of natural assets;
- raising awareness that tourism may be practised in different ways, that are more respectful of the environment and socially responsible.

The importance of a forest

Woods can be divided into two categories: natural and artificial. The first category includes native, ancient woods or woods that were artificial at first and have then naturalised. The second category includes only artificial woods or woods that have been planted only to be felled. The essential functions of a wood can be grouped into three categories: productive function, ecological-protective function, aesthetic-recreational function. The first one is essentially aimed at forestry as well as to commercial exploitation for wood products, such as fruits (chestnuts, pine nuts, etc.), bark, resins, rubber, mushrooms and soft fruits (strawberries, blueberries, officinal herbs, etc.) and game. The ecological-protective function is related to physical (keeping low temperatures and high humidity) and biological aspects (air oxygenation, production of organic substances). By collecting rain, reducing its falling speed, making the soil permeable and reducing surface flows, woods control the outflow of water streams. In addition, they almost completely counter the effect of winds and brightness. Another important function of woods has to do with the pedogenesis (birth and growth of soils), since it replenishes the soil and roots of organic substances.

Sustainable brands

Certification according to FSC

The Forest Stewardship Council (FSC) is an international non-governmental, not for profit organization. It was established in 1993 to promote responsible management of world's forests and plantations. 'Responsible management' means: safeguarding natural environment, delivering real benefits to populations, local communities, and workers, ensuring economic efficiency. FSC members are: environmental and social groups (Greenpeace, WWF, Legambiente, Amnesty International, etc.), native communities, forest owners, industries processing and commercializing timber, companies in large-scale distribution, researchers and specialists, certification bodies, citizens and anybody sharing the goals of the organisation. FSC has adopted a practical tool to accomplish its mission: a voluntary and third-party (independent) certification system specific for forestry and forest products, which operates at an international level. It's divided among between Forest Management certification and Chain of Custody certification. Good forest management certification is based on 10 Principles & 57 Criteria (P&C) which FSC has studied involving all interested parties. These P&C hold international value and must be adjusted on a local scale. Both individual and group (which means for more than one owner) certifications are available and faster and simpler certification procedures are provided for small forest areas. Chain of custody certification (COC), instead, is based on norms related to product traceability and laws over the use of international registered trademarks. A traceability certification implies the identification of all steps from the forest of origin where logs are extracted to the finished product. Possession of a valid chain of custody certificate is necessary to mark products with the FSC logo.

FSC-Italy

Gruppo FSC-Italia is an independent not-for-profit association established in 2001 and officially recognized as a National Italian Initiative by FSC in 2002. It works in harmony with the goals and the mission of FSC International to promote the diffusion of good forest management and FSC certification in our country.

Gruppo FSC-Italia works on a voluntary basis only and without any external funding. Among its members, which have become many by now, figure: forest owners and their trade associations, wood and paper firms, environmental organizations, trade unions, freelancers and certification bodies.

Some public bodies also participate playing the role of observers (Emilia Romagna, Tuscany and Umbria Regions). At a national level, as well as at international level, operating mechanisms adopted by FSC ensure the greatest participation of all interested parties and maximum balance among different interests (environmental, economic and social) at stake.

- Among the activities carried out by the Group we must mention:
- definition of standards of good forest management in accordance with FSC International principles and criteria which suit different forest areas on the Italian territory;
- technical assistance and information to anyone interested in FSC certification;
- promotion of the FSC brand and control over the correct use of the latter;
- encouraging exchange of knowledge and information among actors involved in forest management and wood processing;
- promotion of studies and pilot projects on issues related to sustainable forest management, certification and marketing of certified forest products;
- comparison within existing forest agreements for mutual recognition, etc.

The Association recognizes voluntary certification and independent management of forest products as a tool which can contribute to valorisation of the forest-wood sector and promotion of correct management of woods.

Other sustainable brands

Other available brands apart from FSC are:

- European Ecolabel: ecological quality community trademark, voluntary and selective based on the evaluation of ecological qualities and performance of the whole life cycle of a product; established in 1992 and currently subjected to a guideline approved in 2000;
- Blue Angel: German brand and Ecolabel forerunner, it was founded in 1977 and for roughly ten years was the only ecological labelling programme;
- White Swan: created in 1989 in the northern European area, it has less restrictive rules in comparison to Blue Angel and also certifies companies which use fibers coming from virgin forests having scarce environmental guarantee;
- These brands are the most renowned brands in Italy and Europe but there are others used in Japan, Brazil and other parts of the world.

From wood to paper

Sustainable paper

Until the past century paper was generally made from rags, rope or hemp, a method which went into crisis especially due to continuous epidemics of plague which drove people to burn contaminated clothes and rags causing a drastic reduction in raw material. To make paper, a valid substitute for rags is certainly wood which has much lower costs.

The best paper is made from some conifers such as firs and pines or broad-leaved trees such as eucalyptus, birch and poplar. Also other types of trees, though, are currently used: in Indonesia, for example, trees are drawn directly from the tropical forest to create **MTH** cellulose (Mixed Tropical Hardwood). The quality of this paper is poorer but with no doubt it's less expensive to cut a forest of full-grown trees rather than planting more suitable trees as acacias and waiting for them to grow. This has led to the destruction of thousand of hectares of forest not only in Brazil, as public opinion might think, but also in countries as Canada, Indonesia, Finland, Russia and Africa. If we consider that two thirds of animal and plant species have their habitat in various forest ecosystems and that woods and forests produce oxygen which is

absolutely indispensable for our existence along with water, which is another primary resource in great danger, it's easy to understand that we absolutely need to implement a change in our behaviour as introducing the use of recycled paper or FSC certified paper (Forest Stewardship Council).

Alternative Materials to Wood

Many studies have been recently undertaken to find alternative materials to avoid the production of paper using traditional wood.

In particular, some materials have been selected:

- herbal essences such as straw
- oatgrass residues as corn, wheat and rice
- residues of the processing of sugar cane and sugar beet
- residues of juicing citrus fruits, especially oranges and lemons
- marine surplus as algae
- particular plants as sorghum, cotton, flax and kenaf that has fibers very similar to those of conifers and for this reason is suitable for the production of both mechanical or chemical pastes for paper making.

In particular, cassava, miscanthus, cotton, flax and sorghum are plants with a high per hectare return and rapid growth. Poplar, in any case, is cultivated across the Po valley as it has a quick development ranging around 8-10 years, higher yields and versatility in use.

Paper recycling

The Italian paper industry uses more and more waste paper. The terms waste paper or recycled fibers refer to paper which has already served its fabrication purpose and is recycled within a productive cycle. A feature of cellulose, in fact, is that it can be used multiple times. Fiber recycling can be made only a limited number of times from 5 to 7 times, as during every recovering cycle, fibers deteriorate. Poor quality material coming from pulping is generally used to make cardboard and the best pulping material, instead, is used to make printing paper or other special papers.

Even the collection of waste material is distinguished in two categories:

- pulping from industrial and commercial collection which is made of trimmings of paper products, daily newspaper returns and other newspapers, corrugated cardboard, etc. It's collected at the premises of paper product and editorial firms, department stores, offices and is selected and packed before delivery to the paper mills.
- domestic waste paper which comes from separate garbage collection and is constituted by paper products employed in houses, small shops and offices and is made of newspaper and mixed paper. It must be separated from the beginning from solid urban waste before it's contaminated by other materials which could make it useless.

The fiber from waste paper has a yield of about 95%, whilst wood yield ranges from 30 to 80% depending on the milling procedure which is employed (semi-chemical, chemithermo-mechanical or chemi-mechanical or mechanical). The traditional semi-chemical procedure which is called kraft employs from 2 to 3,5 tons of wood to produce a ton of pure cellulose paper. Even if deinking is necessary, in paper recycling processes fiber must not be separated from lignin or other encrusting substances. In this way it's possible to reduce water consumption up to 80% and energy requirement up

to 50%. The use of recovery material reduces the request of virgin raw materials and even the quantity of materials destined for landfills with a significant reduction of disposal costs.

Production of waste paper

The production of waste paper is very similar to the production of virgin fibers, although a different mixture preparation is required. Infact, during this phase all alien materials which could contaminate production, as iron, plastic glues, glass, paraffins, etc., need to be removed from the pulping process. The presence of these materials, infact, influences the quality of paper and creates problems during the production process. Paper is later reduced in pulp and filtered through a series of strainers which initially remove the coarser parts and progressively eliminate the smallest ones. Producing recycled printing paper requires in-depth straining. Starting from cheap raw materials to obtain paper with a sufficient degree of white, deinking is employed to remove ink present in the pulping process.

The whitening process or reinking clearly requires products which aren't harmful for the environment. Oxygen is employed rather than chlorine and attention is required to avoid the dispersion of harmful products outside the paper mill. Recycled paper production avoids the use of optical brighteners which modify the wavelength of ultraviolet radiations making it visible and thus artificially increasing reflected light favouring deinking.

Both impurities removed and inks must be stocked and employed for other uses. Paper produced from pulping can be similar to paper produced from virgin fibers depending on how sophisticated are the straining and deinking processes. At the end of the straining process the paste produced is passed through a flat board machine and manufactured like any other paper.

Paper mills must be equipped with special machinery for the treatment of waste paper, processing scraps and wastewater. Residual sludge is used as agricultural amendment, within road foundations and brick production. Paper made from organic waste which is difficult to dispose, as algae which develop excessively, gives a great contribution to the environment.

What you can do for forests

Paper recycling

We should remember the importance of paper recycling, infact, recycling 1000 k of newspapers:

- saves 17 trees
- eliminates 3 cubic metres of inert waste
- saves 31,780 litres of water
- produces 75% less air pollution
- produces 35% less water pollution
- saves sufficient energy to provide a 6 month domestic supply
- consumes half energy (57%) in comparison to the energy required to produce one ton of virgin fiber paper

Let's protect woods

Correct individual behaviour is the first step to preserve all ecosystems. Few behaviour rules can be of great importance to preserve forests.

The following are some suggestions to respect this biome:

- avoid lighting fires
- avoid making noise which could frighten animals
- keep on marked tracks to avoid destruction of living species and young seeds

- collect only a handful of flowers and don't collect protected flowers
- gather information on authorized sport activities and obey these rules, don't leave any picnic waste