“Young People in European Forests”

Third edition

European contest about forests and forestry

BOOKLET PDF III

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Introduction - Why do forests still exist? - Europe

If we look at Europe from Space, through the digital eye of a satellite, we will notice a seemingly solid structure formed of vast, dark green woodland. When we compare Europe to all the other continents we realize that Europe is actually a green oasis in the world. It is an area where forests do not decrease (as in the rest of the planet) but on the contrary have increased since the XVIII century. In Europe the the relationship between forests and society continues to evolve, turning its back on the demands for mass raw material and focusing more on the ecological aspects such as the protection and conservation of ecosystems and landscapes. There is the tendency to move away from the typical aspect of using the forest solely for timber production. This is a privilege that only a quite wealthy society such as the European can afford. In the poorer parts of the World, there is pressure for more agricultural land at the expense of forests because of the millions of starving people who use wood to survive on a daily basis.

Europe and its forests

At first glance, the forests of Europe seem to be similar, however, with a closer look the local and regional differences of the most complex ecosystems appear. The boundaries between forests can be distinguished. One can see the northern and mountain spruce forests, the endless terrain of pine forests, the multi species forests on highlands and mountains, the long stretches of riparian forests, the Mediterranean evergreen bushes of macchia, and even some remains of ancient forests. All types of forests are unique depending on the different tree species, the flora and fauna diversity, the fertility of the habitat, land management and forest policy in the area which in certain areas was **sometimes formed** by several countries.

Mountain forest and deadwood

European forests are diverse in terms of the composition of species, the land they cover and the history of their management. However, they are quite similar in terms of their role in the modern world for the landscape and society. During our journey through European forests we will examine their diversity and we will try to discover the strong relationship between forests management and forests role in society. It will be a journey to forests in European countries and at the same time to forests of the past.

We will start our journey from the Mediterranean and we will continue towards the north according to the chronological order of settlement in Europe. We will see how the history of our economy is related to forest resources. The first traces of settlement are 8000 years old and come from southeastern Europe, whereas similar findings in the northern part of the continent appear 6000 years later. Oak and cedar forests died out in the medieval times (in those days people struggled for their survival). Systematic forest management by people in Western Europe dates back in the middle of the last millennium. In northern Europe, management of some forests started 200-300 years ago. Many forests escaped the exploitation phase during the era of industrial development. Sustainable forest management started later providing also a steady income. The journey northwards will also have a different dimension. As we will follow the footsteps of the withdrawing glacier, we will pass through forest areas of different climate conditions and soil surface of different geological age.

Boreal spruce forest, raw postglacial landscape

We will therefore follow the history of civilization and at the same time we will learn about forests which are similar to old forests and grew during the postglacial period. Let's start our journey…

Where do forests grow? Forest area as a result of historical changes - Europe

For most of Europe, forest vegetation is the result of natural succession. If we abandoned the way we use our land today, the forest area would take up about 90 % of the continent, excluding only mountain areas above tree border line, sand dunes on the sea coast, big rivers and their surrounding areas where people have settled down. Within Europe only the endless steppes, stretching from across the Asian plains to the north of the Caspian and Black Sea, where the insufficient amount of rain water prevents the growth of forests, can compete (with) our forests. The percentage obtained

by comparing the area occupied by forests to the total land area (excluding the area covered by water) is drastically different in different European countries. The more mountainous and less inhabited a country is, the higher the above percentage is. Forests in today's landscape is the result of limited human settlement throughout history due to unsuitable terrain (e.g. mountain and swamp forests), inappropriate climate conditions, infertile soil (poor coniferous forests) or deliberate decisions made by the rulers (hunting grounds).The Mediterranean landscape of southern Europe indicates that cattle breeding is mainly responsible for limiting the reproduction and development of forests, which were cut down for timber and fuel. Forests were destroyed and burned down for forming farmlands. The unveiled soil on the slopes of mountains was prone to erosion, and rainfall gradually washed away the most fertile layer (formed by the forest), until it became totally barren. The degraded land, which was later covered in bush, could only be used for sheep and goat herding. Animals ate the new trees preventing forests from returning to their natural habitat. In this way, 90 % of all primary forests of Europe disappeared.

Macchia - evergreen shrubs, which replaced oak forests in the south destroyed by man or pinewoods

During later settlements in the north, people preferred fertile soils in valleys and plains as farmland leaving less accessible slopes and wetlands as meadows and pastures. Changes in Europe's forested land took place during the XVIII and XIX centuries, when mining and railway connection were undergoing intensive development. New forms of industry appeared based on huge amounts of timber. Trains became a new and convenient form of transporting wood, independently of the waterways used for floating down timber. Mass deforestation was also caused by the development of paper and textile industries, which used wood in chemical processing.

The term "Forest" differs throughout Europe– old trees in the Augustów Forest (Michał Orzechowski) and thicket with single trees (e.g. Mediterranean area)

Forest cover in certain European countries ranges from 86 % in Finland to 7 % in Ireland. That gives an average of 35 % in Western Europe and 47 % for the whole of the continent. But do these percentages reflect forests' role in the landscape of each country? There are high forests in areas where land is inaccessible for cultivation and human population is low. Forests for example cover the wild inland of Norway whilst people live on the coast (3/4 of them in cities). Moreover, the percentage of a country's forested area does not include only forests. In Italy, where the forest cover is 29 %, only ¼ are forests with high trees. The rest is plantations (producing timber, cork and chestnut), forest trees for firewood, macchia and bush areas with a low percentage of tree species. The situation is similar in other Mediterranean countries, where climate, soil and most importantly history (including settlement), have pushed forests into inaccessible areas, unsuitable for growing crops or vineyards. The upland and mountain countries (Slovenia, Alpine countries) have a higher level of forest cover because there are mountain slopes, where forests have a soil protective function, preventing mud slides and avalanches. Forests can also be helpful in case of increased rainfall. The crown of a single large tree can hold up to 500 litres of water. If a slope is covered by a multilayered forest then a limited amount of water reaches the mineral soil which is then steadily distributed to the soil. Understorey also slows down the speed of the water flow, preventing floods in river valleys. Depending on the intensity of the rainfall, forests can hold up to 85% of all water. This is the main reason of the high forest cover percentage in mountain countries.

On the other hand, there are countries with a very low percentage of forest cover (e.g. United Kingdom and Ireland – around 10 %), whereas in the past they were covered by dense deciduous forests (and coniferous in Scotland). Nowadays, only a few fragments of these natural forests have remained, such as oak and beech forests (south England and highland Wales), or pine (Scotland), all of which are treated as natural monuments. Other forest areas are covered by coniferous forest trees, used mainly for timber production.

Countries in Western and Central Europe are very similar in terms of forest cover, forest composition and structure. The percentage of forest cover reaches 30%. Native species are the most dominant, but there is a large group of highly productive, fast growing trees (especially various species of pine and spruce), created by the XIX century need for fast timber growth and harvesting. Despite long settlement and turbulent times, some of the forests have kept their grandeur, resembling the ancient forests of Europe. That was because rulers used isolated forest areas for hunting, which was not just for entertainment but it also provided food. That allows us today to enjoy the beauty of these fertile lowland forests, such as Białowieża Forest in Poland and Belarus and also New Forest in Hampshire, Great Britain, one of the oldest forests to be protected for hunting (since the XI century).

Forests often occupy land unsuitable for agriculture (forest on a sand dune) – areas unsuitable for settlement. (Michał Orzechowski)

Who owns forests? Forests ownership influences their quality, their distribution and their exploitation - Europe

Among European countries we can distinguish three groups of countries with different percentages of public forests. The highest percentage of private forests is found in the Scandinavian countries (Norway, Sweden and Finland), and also in France and Austria. In these countries the percentage of public forests does not exceed 30%. Nevertheless, there are not any strict restrictions on public access to private forests, apart from some exceptions. On the other hand, in Ukraine and Belarus the State owns all forests. Access to forests is usually restricted in countries with less forest cover and with food traditions related to collecting forest fruits. Such restrictions are applied in countries like Italy, where people who pick mushrooms, chestnuts and "gifts of the forest" believed that forest was their own yard or agricultural crop.

Private forests - production - or state subsidies (Michał Orzechowski)

Forest ownership plays an important role in forming forest policy which promotes the conservation of the environment. The State as a dominant owner can follow non profitable policies in relation to forestry in order to keep the society happy. It is much harder to fund private owners, in order to convince them to give up their personal profit and follow policies aiming at nature conservation and recreational activities in the forests. It is much easier to protect large areas belonging to one forest

owner from the harmful effects of strong winds, by creating appropriate spatial structures between neighboring tree stands.

Moreover, creating a network of observation points can also protect these areas from fire. Another important aspect is the possibility of planning and implementing actions for changing the composition and structure of tree strands in greater forest areas. Reconstructing tree strands is an action beyond the prospect of financial profit within one or two decades. The durability and importance of these reconstructed tree strands is not counted in terms of money.

Only the state can follow non profitable policies in valuable natural forest areas (protected tree stands, nature reserves) (Michał Orzechowski)

What are forests? Forest diversity in Europe

Plant formations in Europe have a parallel but quite different layout. Their structure is influenced by the oceanic climate in the western part of the continent and the continental climate in the east. There are conditions favorable for European forest vegetation south of the arid tundra of the Arctic. European forest vegetation begins with a stretch of shrubs and rare birch forests on the Scandinavian Peninsula and in Russia. Further south we will find the taiga, consisting of conifers, such as spruce and pine, and to some extent fir and birch. Moving closer towards the equator, we are likely to spot more and more deciduous species: aspen, fewer elm, alder, maple and lime. Further to the south the taiga zone passes into deciduous and mixed forests of oak, beech and other species. In Western Europe, which does not stretch that far to the north, we will not find a taiga zone. We will find unique forest vegetation along the Atlantic coast (the coasts of west Norway, Great Britain, Ireland, western Spain and Portugal), such as moors with beeches and oaks. Further, in areas with a milder climate, we will find the typical forests of the region. On the shores of the Mediterranean and in the southern and central parts of the Iberian Peninsula we can find typical Mediterranean vegetation, dominated by sclerophyllous, eternal green thicket, formed after the destruction of forests. The meridional position of an area, as well as its height, influences the composition of the forest. In southern Europe we can find forests at a higher altitude (in Bulgaria at 2300 meters above sea level) than in northern Europe (in Scotland at 500 meters above sea level).

The original European vegetation has changed as a result of the economic activity, especially in the central and southern part of the continent. That occurred at a smaller scale in the north and north

eastern part. In the British Isles natural vegetation covers only 10 % of the land (not only forests, but also heath land and bog), whilst in northern Scandinavia and Russia this percentage comes up to 90%. However, these are areas unsuitable for agriculture because of their climate.

Multi-species forest on a mountain (Michał Orzechowski)

The diversity of species in the forests depends on the geographical position, but also on the forest management policy implemented over the years. For the past 200 years, European forestry has preferred monospecific coniferous tree strands (mainly spruce and pine), resulting in the reduction of mixed and deciduous forests. Currently, due to the reconstruction of tree stands, there are more forest areas adapted to their natural habitat. Across Europe, mixed forests cover about 14 % of forest area. The largest shares of these tree strands are found in Malta (60 %), Czech Republic (56 %), Latvia and Estonia (above 40 %). Monospecific coniferous forests dominate because of natural conditions (climate and soil), mainly in northern countries (Scandinavia) and in mountain areas (Austria, Germany, Switzerland).

Productive spruce forest (Michał Orzechowski)

Coniferous species sometimes dominate because of economic decisions related to forest management. In Great Britain and Ireland, the large share of coniferous species is the result of a long-term forest policy, which supported the cultivation of sitka spruce - an alien species to the flora of Europe. Deciduous species play a greater role in countries situated in the south of the continent: Serbia, Bosnia and Herzegovina, Croatia (80 %), Hungary and Italy (70 %).

One way to measure resources in a forest is to calculate the growing stock which is the volume of the total standing timber at a particular time. Only wood suitable for processing is usually calculated, excluding thinner branches. The growing stock in the forests of Europe varies. In a single species stand, it depends on the age, the composition, the structure and the density of the forest. The average growing stock in the whole continent is about 140m^3/ha, while growing stock in Ireland, Greece and Spain are below 100 m^3/ha. In the alpine countries these numbers are much greater due to high rainfall and large tree strands of fir and spruce. In Austria it amounts to 309 m3/ha, in Slovenia and Germany - around 280 m^3/ha. Forests in Slovakia and the Czech Republic have an average of 260 m^3/ha because of the domination of hill and mountain forests.

In order to have sustainable forest management we need to know the annual increase of wood volume (annual increment). The volume of the timber logged every year, is not permitted to exceed the annual increment. More specifically, is permitted to be logged only a 60-70% of the annual increment every year. Tree stands with the highest growth rate are situated in western and central Europe (5 m^3/ha per year). Limited growth is due to the following factors: short growing season in Europe and drought in southern Europe. Factors speeding up growth are: longer growing season in the south and higher amount of rainfall associated with milder maritime climate in the west.

Among European forests one can find areas which provide firewood. Tree stands providing firewood consist of tall and thin trees and species sprouting from a cut tree. These stands rarely exceed 30 years old and they are treated as forests of lower category. They are located mainly in southern Europe - in France, Italy and Greece. Forests with high trees coming from seeds and seedlings are the most valuable category. The age of these forests is distinguished by different age classes (20 years). The largest areas are occupied by trees between 20-80 years old (II-IV class). That resulted from afforestation after World War II, which took place in the central part of the continent, due to changes of borders and land ownership. In Europe there are 13 million hectares of forests, more than 100 years, which will continue to exist because of the restrictions enforced for environmental protection and because of social pressure. Age classes of forests are evenly distributed in Switzerland, Luxembourg, Czech Republic, Finland and Norway. Ireland is among the countries with an irregular age structure of tree strands. That resulted from afforestation funded by the European Union. Countries in a similar situation are Portugal, Austria and Denmark. On the other hand in Germany, the percentage of the tree stands of a younger age group is extremely low as a result of forest cultivation and forest regeneration**.** For example, the age for pine felling in the Nordic countries ranges from 110 to 180 years, in Central Europe from 80 to 120 years, in Hungary from 60-70 years and in the countries bordering the Atlantic Ocean up to 50 years (which is also an index of the species growth rate).

Forest with deadwood

The geographical location of a country affects the richness of fauna and flora in forests. There is certainly a greater diversity in species in the south of the continent. European forests consist of around 150 species of trees, all at different distribution. The largest area is covered by pine, spruce, beech, fir and oak. Depending on the location of the country, between 200 and 6,000 vascular plants can be found. The majority of them are found in countries in the south and east of Europe and less in the north of Europe. The problem for some of the forests is the large number of alien species. In Northwest countries, introduced species take up an average of 15 % of forest areas, but in some countries this percentage is much higher (Ireland, Denmark, Iceland, Great Britain, Hungary, the Benelux countries). In the group of alien species, we can also include species that grow well away from their natural habitat. Among coniferous species one should first mention spruce, Sitka spruce, Douglas fir, and several species of pine. Among deciduous trees, non-native species include red oak, robinia and different poplar species. When moisture and temperature conditions are favourable, eucalyptus tree covers large forest areas (Spain, Portugal). Some of the alien species which are invasive, have adapted to the European forest ecosystems and are now occupying new areas. Some of them are: robinia – black locust *(Robinia pseudoacacia)* and black cherry *(Prunus serotina)*, and *Ailanthus altissima* (Slovenia, Albania) in the south-east.

Robinia forest

Forests are home to half of the mammals of Europe. Their number depends on the location and history of the countries' economy. The largest group of mammals lives in the forests of south-eastern Europe, the Czech Republic, Slovakia and Lithuania. Moreover, in the Czech Republic, Slovakia, Austria, Poland, Scandinavia and Lithuania we can spot a large number of nesting bird species in

forests. Significantly fewer nesting birds are found in the forests of Germany, Italy and the Benelux countries.

What's the relationship between man and forests? Forest management and nature conservation - Europe

Forests in Europe are usually preserved in areas unsuitable for agriculture. There is also a small percentage of forests untouched by human intervention. Virgin forests (ancient / pristine / old-growth /primary) which are not affected by man account for about 4% of all forests of Europe, although defining what a virgin forest is varies among different countries. Most of them grow in places difficult to public access as in northern Scandinavia, northern areas of the European part of Russia, the Alps and the Balkans. Most of these forests are located in Sweden (16 %). On the other hand, few European forests derive entirely from artificial plantations. There are some exceptions. Countries with many plantation crops are those with a well-developed alien species cultivation (Spain, Turkey, United Kingdom and Ireland, France and Portugal). There are no plantations in Finland, Germany and Austria. In defining plantation crops, the purpose of their establishment is taken into account, for example fast timber production. In plantations, soil protection is taken into account, including fertilization, keeping regular spacing between trees, pruning. Forests, consisting of shade-intolerant species, may resemble plantation crops in the early stages of their life. However, even in plantations with few tree species and regular spacing between trees, the tending treatments may lead to loss of this spacing. These stands will become semi-natural forests due to random factors and foresters' decisions. In Central Europe the composition of Scots pine forests (*Pinus sylvestris*) can change due to their enrichment with oak (because of birds) and birch (wind).

As a result of afforestation during the period after World War II and of a tendency to propagate pine and spruce, large forest areas over-covered by spruce and pine. These forest areas need restoration in order to have more deciduous trees and firs. This change occurs in at least two ways. In younger tree stands of II-III age class, shadow-tolerant species are introduced under the pine. In a few decades they will dominate by replacing the previous dominant species. Old tree stands either not well adapted in the natural habitat or stands with a closed canopy that does not let light reach the forest floor, are restored by cutting. The type and size of felling depends on the demands of the introduced younger generations.

Effect of group or partial cutting - lots of species

Revaluation of the role of European forests forced managers to use management methods, which do not lead to total removal of all old trees. Cutting trees in groups on small areas of irregular shape are partly a response to social expectations for forest protection. Due to the above reason and not for economical ones, clearcuttings have been abandoned for the stands' regeneration. However, in tree stands requiring light, which grow in poor habitats, abandoning clearcuttings is not entirely possible. In the case of natural regeneration of shade-intolerant species by seeds, clearcutting is necessary.

Reconstructing tree stand

Despite various restrictions in timber production, demand for wood is increasing in all European countries. The European Community faces a dilemma. How to support ecological forestry in their area and at the same time cover the growing demand for wood? Is importing raw materials from outside Europe the proper solution? Imported timber, in order to be cheap and profitable, should either derive from plantations or from non-sustainable logging. In this way we protect forests in our home country but we cause forests degradation in other, poorer regions of the world. One solution is to follow a more rational approach to multifunctional forest management at local level such as adopting a system for certifying the origin of wood raw material. Certified products guarantee that all proper procedures during the entire cycle of production, transportation and processing were followed.

Wood

There are around 90 different forms of protection for European forests. National Parks and nature reserves (with a different protection status) are the first to be mentioned. Other forms include areas of protected landscape forests of aesthetic value. A comparison among different forms of nature protection between countries in Europe is a difficult task, due to the different importance of each one of them. In each country these forms are defined differently and include different methods for forest

conservation. Some of the forests in central Europe that protect water and soil have a higher felling age or restricted uses. Sometimes tree felling in “normal” high forests (mountains of Italy), is even more restricted, i.e. cutting down only single trees. The percentage of forests under strict protection does not always guarantee high level of natural resources protection. This percentage varies from 1-2 %, up to over 10 % (Slovakia and Portugal), and up to 24 % (in Liechtenstein). Strict protection rules give the chance to observe and sustain natural processes occurring in isolated ecosystems. In some cases, strict protection leads to significant changes in the forest ecosystem.

Natura 2000, Birds

For the protection of nature, a programme covering the whole of Europe was established, named Natura 2000. The programme is an EU wide network of nature protection areas established under two EU Directives: the Birds Directive and Habitats Directive. The aim of the Natura 2000 network is to ensure the long-term survival of Europe's most valuable and threatened species and habitats. The programme aims at sustainable land management in Natura 2000 areas and should have social acceptance. The existence of Natura 2000 areas involves several obligations. Before giving permission for the implementation of projects that may affect these areas, their impact must be assessed first. If there is a negative impact, permission is not given because the ecosystem’s protection is more important. Any deterioration of natural habitats or birds population should be prevented, while their current status should be ensured. Moreover, it should be mentioned that natural habitats and birds protection also entails the protection of all the elements of the ecosystem. About 20 % of Europe's land area is under Natura 2000 protection where forests play the most important role.

What will forests be like? Future and threats - Europe

During the history of forestry there has been evidence for the disruption of the forest production cycle due to the appearance of insect pests, natural disasters and extreme climate changes- drought, strong winds, floods and frost. Fungal diseases are signs of modern times. Seedlings deprived of mycorrhizal fungi are vulnerable to parasitic pathogenic fungi.

Melolontha melolontha

The decay of an ash forest

The number of harmful insects has increased partly because of humans who created even-aged monospecies stands in large areas. Because of the disturbed balance and the absence of self defense mechanisms of the forest ecosystem, the population of these harmful insects could rapidly increase, leading to disaster. The largest pest gradation in European forest history caused by the Nun Moth *(Lymantria monacha)* from 1978 till 1984 in Poland, destroyed about 1/3 of the country's total forest area. These disasters can only be faced with chemicals which are expensive and have a negative impact on the environment. Since prevention is better than cure it is better to keep the balance of the forest ecosystem than try to face the negative impacts. Climate change is increasing the risk of another insect gradation caused by a species with unknown economical impact. From 2005 to 2007 in central Europe a large number of oak died because of the larvae of jewelbeetle *(Agrilus)*, which until then was considered a rare species.

Forest after a hurricane.

Among abiotic factors, wind has the most intense effects. Strong winds, braking and knocking down trees in large areas, hit European forests regularly with increasing frequency. Particularly heavy losses are caused by wind in mountain areas, dominated by man-made spruce forests. Mixed forests are much more resistant to these threats, especially if they consist of species adapted to local conditions, such as beech and fir forests.

Fire is another important factor. Forest fires have a devastating impact not only in the warm and dry southern countries but also in other European regions. That happens because of several factors: lower forest humidity (dehydration), rising average air temperatures, declining health of forest stands and greater human intervention. Unhealthy forests with open canopy let more light reach the understorey, thus helping ground vegetation, especially grass, to grow. Grass vegetation then becomes dry and can easily catch fire.

Despite numerous threats the future of European forests is bright. Their total area is increasing. Forests continue to offer a lot to the people. Society continues to exert pressure on the State to abandon the productive functions of forest resources, or at least reduce them. There are many European programs for forest protection. European forests are certainly changing for the better.

A young tree, a young forest, a hope for the future...

Forest characteristics and forest types - Austria

Austria's forests cover about half of the country's federal territory. The growing stock is more than one billion m^3, which offers the potential for sustainable forest management.

The forest as a habitat fulfills various functions. It is the natural habitat of a wide variety of plants, animals, and microorganisms – a complex ecological system in which all its elements interact.

Austria's forests are today a cultivated landscape, the result of centuries of human care and attention. Original virgin forests are rare and restricted to small areas. Nevertheless, the forest is still that element of the landscape that is closest to nature. It is a natural resource. That's why forest management should be in harmony with nature through an ecosystem-oriented approach. Tending measures increase the stability of forests and favour desired tree species; the timely removal of old trees produces light and space for a quick and natural regeneration or afforestation. Forest stewardship guarantees that forests can fulfil all their functions permanently. The benefits of forests and their functions are defined in the Forest Act which focuses on the protective function of forests, wood and timber production, the possibility of using forests for recreational purposes, and the social benefits of forests.

The key functions of Austrian forests (according to the Forest Development Plan) are: Economic function 64.55 %, Protective function 30.73 %, Beneficial function 3.61 % and Recreational function 1.11 %.

In the mountain country of Austria (50 % are mountain forests), Alpine natural hazards are a serious threat to people in some areas. Natural hazards such as floods, debris flow, avalanches, landslides and rock fall threaten people, their settlements, economic activities and traffic routes. Forests protect people against these natural hazards!

Tree species composition:

Austria's productive forests are characterised by a high share of conifers. According to the Austrian Forest Inventory 2000/2002, the share of coniferous stands is share 66. 8 %. The share of deciduous stands is 23.9 %. The remaining 9.3% of productive forest land consists of blanks, gaps and shrubs. The percentages of various forest stands are: pure coniferous stands 62 %, (pure spruce stands 41 %), mixed coniferous & deciduous stands (more conifers than deciduous trees) 15 %, mixed

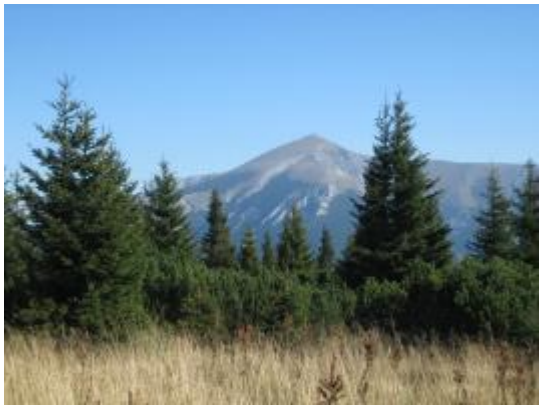
deciduous & coniferous stands (more deciduous than coniferous trees) 11% and pure deciduous stands 12%.

Austria's forests are not evenly distributed over the federal territory. A high percentage of forests is located on the steep slopes of the Alpine regions and the lower mountain ranges. Areas with low forest cover are found in the summer-warm east. The total growing stock in Austrian forests is 1095 billion m^3 in Austrian forests and 1/3 of the annual increment is felled every year. Thus, the demand for wood, this environmentally friendly and renewable domestic raw material, will continue to be covered.

Typical and exceptional fauna and flora species in forests - Austria

The distribution of tree species in percentages is the following: 53.7 % Spruce, 2.3 % Fir, 4.6 % Larch, Pine 5.6 %, other conifers 0.7 %; 9.6 % Red beech, 2.0 % Oak, 12,3% other deciduous.

In Austria we can find 125 forest plant communities. Important natural forest communities are: Spruce, fir & beech forest, Spruce & fir forest, Beech forest, Sub-alpine spruce forest, Oak & hornbeam forest, Mountain spruce forest, Larch & stone pine forest, Mountain maple & ash forest and Dwarf pine forest.



Austrian's forests are habitats for many typical middle European wildlife. Hunting has a long tradition. Income from the commercialisation of shooting rights on private, municipal or cooperative hunting grounds is a major share of the forests' total yield. The main species are: red deer, fallow deer, roe deer, chamois, moufflon, wild boar, fox, badger, martens, hairs and feather animals mainly pheasant, with roe deer ranking at the first place (254,000 according to 2009-2010 hunting statistics).


We *can also find a lot of herbs and shrubs in Austrian's forests.*

Forms of nature protection such as national parks and Natura 2000 sites - Austria

Forests cover about 47 % of Austria's federal territory and are thus of great importance for the maintenance and enhancement of biodiversity. Austria's forests have always offered protection, have fulfilled important beneficial functions such as providing drinking water, and have offered living areas for humans, animals and plants. Moreover, forests are also an important economic factor for Austria. About 43 % of the Natura 2000 areas reported by Austria are forest areas. About 2/3 of the forest area can be classified as natural, near-natural or semi-natural.


There are 93 forest biotypes in Austria. Rare forest types are for example recreational forests, which are particularly endangered by human intervention. Also peat, swamp and marsh forests are sensitive ecosystems whose development requires incredibly long periods of time.

At present, Austria has six National Parks. In many cases these parks are the last resorts for animal and plant communities which, without appropriate protection measures, would be threatened by extinction. Separate National Park Administration Offices have been established to protect these valuable ecosystems. The Names of the six National Parks are: Hohe Tauern, Kalk Alps, Gesaeuse, Thaya Valley, Danube Floodplain and Lake – Neusiedl – Seewinkel (www.nationalparke.at).

Nature parks, unlike national parks, are areas managed by man and smaller in size. (www.naturparke.at). Biosphere reserves (parks) are natural landscapes which are of particular importance to humans. The biosphere park "Wienerwald", the first such park world-wide, is located very close a city of more than one million inhabitants.

Organization of Forestry - Austria

In Austria, sustainable forest management is implemented within an established legal framework. Forest enterprises, wood industry, sawmill and paper industries provide in total some 50,000 jobs. Furthermore, many of the 145.000 forest owners earn more or less an additional income from the forest.

Ownership status (2008)

Private forests of less than 200 hectares accounts for 49. 2 %; private forests of more than 200 hectares accounts for 21.5 %; Federal Austrian Forests (Österreichische Bundesforste AG) are 15. 5 %; Community forests are 10. 3 %, Communal forests are 2.1 % and Provincial forests are 1.4 %.

Austria is the only country in the European Union demanding from forest owners with forest property larger than 1000 hectares to hire certified professional full-time foresters. Furthermore, there are forest experts from the Provincial Chambers of Agriculture and the Forest Authorities who assist small-scale forest owners with counselling services and practical advice. Thus, well trained forest experts are intensively working for Austria's forests on their entire area.

In order to ensure the interests from forest use under a sustainable forest management as best as possible, the Federal Minister of Agriculture, Forestry, Environment and Water Management already initiated the Austrian Forest Dialogue under the motto "forest concerns us all!" in April 2003. The management of Austrian forests is formed to a great extent by forest owners. The framework for sustainable forest management is defined by politics, whereby the Austrian Forest Dialogue plays a major role in the dynamic establishment of this framework. The first Austrian Forest Programme is an important result of the Austrian Forest Dialogue.

Forest Authorities

All actions and activities of the forest authorities are based on the 1975 Forestry Act as amended. For the implementation of the Forestry Act, carried out by indirect federal administration, responsibility falls under the District Administrative Authorities first, then under the Provincial Governor and last under the Federal Minister of Agriculture, Forestry, Environment and Water Management.

Forest characteristics and forest types - Belgium

Forest is an essential element of our land, fulfilling four major dynamic functions for the benefit of society:

- Economic: wood production. Forest creates many jobs in the sector of wood production and processing (sawmills, paper, panels, etc.);
- Environmental: major source of biodiversity. Forest protects the soil against erosion and has a positive effect on water and air cycles by producing oxygen and absorbing carbon;
- Social: a friendly place for people seeking clean air and open space. Forest has something to offer to everyone: walkers, fishermen, hunters.
- Important for the landscape.



Typical and exceptional fauna and flora species in forests - Belgium

Breakdown of tree species distribution in the forests of Belgium

Broad-leaved 47 %

Oaks 13 %
Beech 7 %
Poplar 5 %
Other 22 %

Conifers 41 %

Common spruce 25 %
Pine trees 9 %
Larch 2 %
Douglas 3 %
Other 2 %


Forest species and silviculture

Given the diversity of soil types (sand, silt, clay) and climates (from 0 to 700 m above sea level, from 700 to 1400 mm of rainfall), many species have adapted to our country.

The total growing stock amounts to 140 million m³, the increment is 6.5 m^3/ha/year, and the annual cutting is 4 million m³. Thus, the wood removed is slightly less than its biological production. It is worth noting that there has been an increase in fuelwood produced in Belgium.

Fauna

Of the rich wildlife living in the forests of Belgium, only the roe deer is found throughout the whole country. Stag and wild boars are only found in the south of the country, where sheep and fallow deer can also be found. These populations have been increasing sharply over the past few years.

The roe deer and stag populations have doubled in 30 years, while the wild boar population has tripled! This abundance of wildlife can cause damage to the forest (by stags) and to farmland (by wild boars) in some places.

Forms of nature protection such as national parks and Natura 2000 sites - Belgium

Preserving nature

In Belgium, the European Natura 2000 network covers 13 % of the national territory.

Integral or managed nature reserves are scattered across the country. In the Walloon Region these reserves cover around 10.000 ha.

Forest Certification

The SRFB, the Royal Forestry Society of Belgium, supports PEFC certification. This refers to the Programme for the Endorsement of Forest Certification and is the world's largest forest certification system, covering 70 % of the certified area in the world in 2010. In Wallonia, this covers 51 % of the forest area and 260 Belgian companies have already had their chain of control certified by the PEFC. The FSC, the Forestry Stewardship Council, is also present in the Flemish Region.



Forest and CO_2

Belgian forest stocks around 480 million tonnes of CO_2 equivalent (woody biomass, forest litter, dead wood and surface layer of soil). In addition, due to the removal of wood and its long-term use, the forest compensates for the annual CO_2 emission of 800.000 cars! However, the most important feature of wood in relation to CO_2 is in fact substitution. Wood used in construction, furnishing, etc. replaces other materials, such as PVC, concrete or aluminium, which demand far more energy for their production. The same applies for wood used for energy, which replaces fossil fuels.

Organization of Forestry - Belgium

Forest area:

Today forest in Belgium accounts for 22 % of the national territory distributed among the three regions of the country:

- 78 % in Wallonia, in the south of the country
- 21 % in the Flemish Region, to the north
- 1 % in the Brussels-Capital Region in the centre.

The area covered by forest has increased by 25 % in 150 years!



Owners and managers

(1) Private forests

Most of the forests in Belgium belong to private owners (58 %). With an average area of 2.5 hectares per owner and over 100.000 owners, private forests are characterised by a relatively high level of parcelling and a wide range of owners. These private forests are managed directly by their owners either through a manager or by a Cooperative selected by the owners.

Forest management is determined by specific legislation:
- the Forestry Code (Code forestier) in the Walloon Region
- the Forest Decree (Bosdecreet) in the Flemish Region.

(2) Public forests

42% of forest is distributed among public owners. This percentage includes national forests belonging to the Regions (11 %), the Communes (28 %) and the Provinces, Public Social Welfare Centres and Church Councils (3 %). These forests are managed by the following forestry authorities:

- the DNF or Department of Nature and Forests in the Walloon Region
- the ANB or Nature and Forest Agency in the Flemish Region
- and the IBGE or Brussels Institute for Environmental Management in the Brussels-Capital Region.

Forestry authorities are divided into:
- regional directorates and
- forest ranges and forest districts.

Taxation and aid for the forest

Silviculture is taxed by means of a flat-rate property tax, independently of wood sale. This tax is levied, on the basis of the cadastral revenue:
- withholding tax on real estate,
- tax on natural persons.

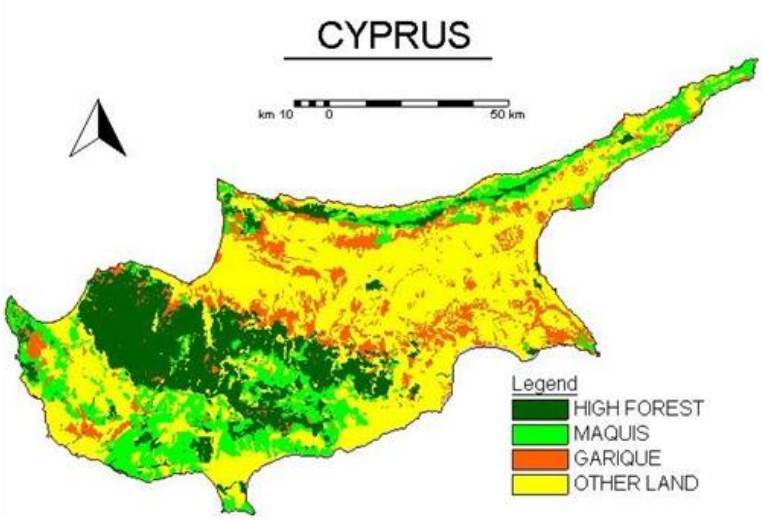
In Wallonia, since 2008 with the new forestry code, inheritance tax and taxes on donations are no longer payable on forest stands, but only on forestland value.

In Flanders, inheritance tax and taxes on donations on both land value and forest stands have been abolished for woods and forests which are either managed in accordance with the criteria for sustainable forest management or are part of the "*Vlaamse Ecologisch Netwerk"*, the Flemish ecological network. The Flemish Region also offers specific aid for certain plantations, preparation for expanded management plans and help in the construction of paths for the general public.

Forest characteristics and forest types - Cyprus

Area

Cyprus is an island in the Mediterranean Sea in south-eastern Europe. It is the third largest island in the Mediterranean.



Vegetation map of Cyprus (Natural resource information and remote sensing centre 1998)

Climate

Cyprus has an extreme Mediterranean climate. It has a hot, long, dry summer and a changeable warm winter. The mean annual temperature is 17.8° C and the relative humidity is 60 %. The mean annual rainfall is about 500 mm. (CMS 1995).

Typical and exceptional fauna and flora species in forests - Cyprus

Flora

Cyprus geographical position at the crossroad of three continents (Europe, Asia and Africa), explains its rich natural vegetation. The study of Cyprus flora began in 1787. Many botanists and collectors wrote guides for Cyprus plants, but all information about Cyprus flora were dispersed in a large number of different scientific publications until 1977, when R. D. Meikle presented the first volume of "Flora of Cyprus" a work that was completed later in 1985 with the edition of the second volume. This work gives detailed description of all native and the main introduced plant taxa, which were recorded in Cyprus. Eucalyptus species are among the species that were introduced in Cyprus.

Land use in Cyprus

Forests and forest areas: 44% (only 19 % of this is high forest and the rest is maquis and garigue)
Agricultural areas: 48%
Built-up areas: 6%
Other infrastructure: 1.5%
Inland water bodies: 0.5 %

Forms of nature protection such as national parks and Natura 2000 sites - Cyprus

Biodiversity in Cyprus


Reptiles

Cyprus, just like the other Mediterranean countries, is characterized by a large number of plant species that have limited distribution and a high rate of endemism. Endemic species are very important for flora in Cyprus. Out of 1,780 vascular plants found in Cyprus, 145 are endemics.


Endemic cedar *Endemic tulip*

Some of them are only found even in small areas like Troodos Mountain which is considered to be very important in terms of flora.


Vulture (Gyps fulvus) *Endemic mufflon*

In Cyprus we can find various flora and fauna species such as: 28 mammal species (16 bats), 5 of which are endemics, 365 birds species, 7 of which are endemics, 22 reptiles, 6 of which are endemics, 3 amphibians, 52 butterflies, 9 of which are endemics and more than 3500 insects, many of which are endemics. Moreover, in Cyprus we can find 48 natural habitat types (14 priority habitat types) and 19 species of Annex II of Birds Directive.

The Natura 2000 network in Cyprus

Cyprus as a member of the European Union is trying to fulfil its obligations towards EU Directives and legislation concerning Nature Conservation. Thus, 36 areas are Special Community Interest Areas (SCIs), approved by the Commission in March 2008. Of these areas 31 are terrestrial, 1 is marine and 4 are both marine and terrestrial areas. A couple of additional areas will be proposed as SCIs soon.

Also, 19 areas were designated as Special Protection Areas (SPAs) for the protection of birds and animals. More areas will be designated as SPAs soon.

Organization of Forestry - Cyprus

Forests

Private forestry does not exist in Cyprus since forest, due to climate conditions, has no commercial value. Thus, only State forests are properly managed. Forests can be classified as follows:

High forests cover 18.5% of the land of Cyprus. The main species found in Cyprus forests are: *Pinus brutia* (Calabrian pine), the most commonly spread, *Pinus nigra* (European Black pine), found only around the peak of the highest mountain of the island, Troodos, endemic cedar *(Cedrus libani var. brevifolia)* and a number of broadleaved species along the riversides of the island, such as planes, alders, poplars, acacias, eucalyptus. All these species together with understorey vegetation of ladjia (golden oak), strawberry trees, terebinths, lentisks, bay laurels, myrtles, carob trees, olive trees, junipers, constitute a unique forest cover, ideal to host a large variety of smaller plants, animals, birds and insects, forming the various terrestrial ecosystems.

Calabrian pine stand

Kavo Greko National Park

Maquis: cover 13.6% of the land. Maquis consist of dense thickets of tall shrubs, 2-5 m high, such as strawberry trees, terebinths, lentisks, bay laurels, myrtles, carob trees, olive trees junipers, etc.

Phryghana: 9.4 % of the land is covered by phrygana (Garigue), a type of vegetation with low scattered bushes rarely higher than 0.5 m, and with perennial, biennial and annual herbaceous species in abundance such as rock roses, thyme, prickly burnet, thorny gorse, sage.

Benefits

The major outputs from forests are wood products and non-market services and influences. Wood products (about 10,000 m^3 per year) go to private sawmills. Less quantity goes for charcoal manufacture, for fuel wood and for other minor purposes. Local production can satisfy only about 1/10 of the demand for sawn wood, resulting in large quantities of imports.

Forest Functions: Non – wood forest products

Botanical garden

Typical picnic site

In Cyprus, forest influences are of higher importance than direct economic returns. Ensuring these influences is a priority in the declaration of the Forest policy. 6 out of 16 objectives refer to the protection of forest influences and services, namely climate protection, water and soil conservation, agricultural protection, public amenity and wild life. It is of great interest to note that Forest Revenue is referred in the 16th (last) objective as follows:

"To provide for the community the maximum revenue compatible with sustained yields after all the above aims have been achieved".

Based on this Policy the department of forests has managed to establish a network of nature trails, picnic places and camping sites in order to provide opportunities for recreation to locals and visitors. A number of visitor centres and 3 botanical gardens contribute significantly to environmental education and public awareness.

Forest Protection

In Cyprus as in many other countries of the Mediterranean, fires are considered as one of the major destructive agents of forests and woodlands. Prolonged hot, dry and windy summers, landscape, inflammable vegetation and human activity cause the outbreak and quick spread of fires. Furthermore, urbanization, abandonment of rural areas and the increased number of visitors in the forest, increase fire risk.
The Department of Forests, the authority responsible for the prevention and control of forest fires, is aware of the increased fire risk and takes a series of measures for:

(1) The prevention of fire outbreaks

These measures include:
Designation and establishment of picnic and camping sites
Patrolling
Detection and reporting system (fire lookout towers, ground and air patrolling system, forest telecommunication, reporting by the public)
Law enforcement
Education and publicity
Automatic forest fire detection system

(2) Pre-suppression and control of fires:

These measures include:
Roads and Jeep-tracks
Fire brakes
Water tanks, hydrants, water valves
Vegetation treatments
Heliports
Fire safety systems

Fire brake

Fire look –out tower

Group of fire fighters

Helicopter in action

(3) Suppression

These measures include:
Fire Fighting Squad
Fire Duty Roster of Forest Officials
Organization of Forestry Works
Fire Engines
Air means
Fire fighting tools

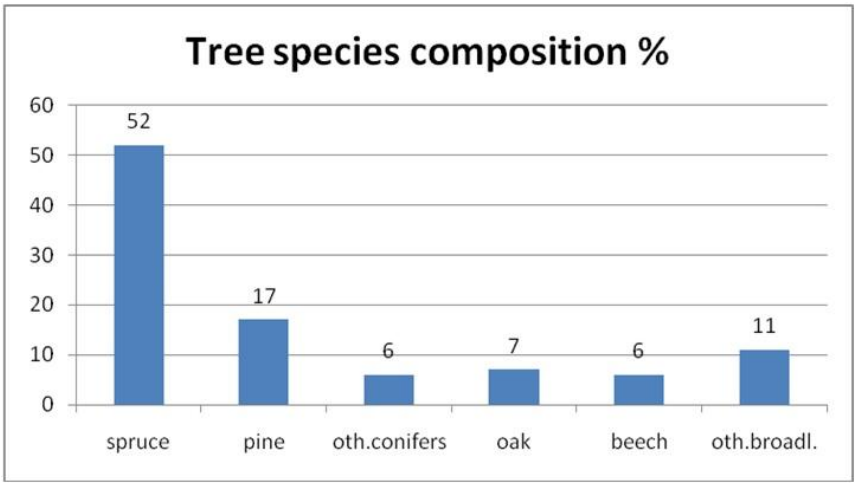
Forest characteristics and forest types - Czech Republic

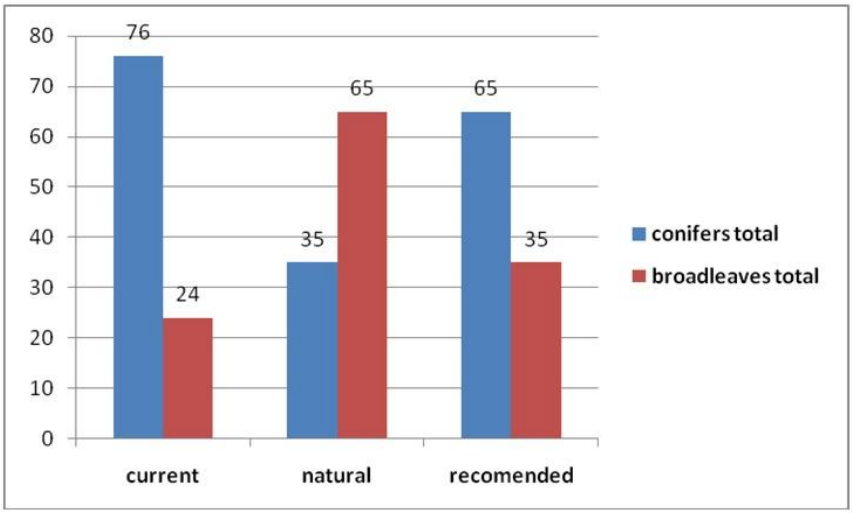
Forest area in the Czech Republic covers about 34% of the country's territory.

The Czech Republic is one of the smaller European countries. Nevertheless, it has a great variety of natural resources including quite diverse and rich forest biocenosis. Diversity of sites along with the geographical position of the country, situated at the crossroads of several phytogeographical areas, resulted in the creation of a wide range of plant associations including naturally predominant forests.

Forest changes in the past

Forests in the Czech Republic changed considerably during the settlement period and later on during the industrial revolution. Forests also changed significantly because of human intervention. Because of the increasing demand for timber consumption forests needed to be protected by special laws. Theresian Forest Orders (1754) provided for the first time the framework for sustainable forest management. Species composition and distribution of Czech forests altered in the past in an effort to increase timber production and satisfy the demand for the most frequently required tree species (spruce, pine). Coniferous species now dominate in forest stands structure.





According to 2009 statistic data the current share of conifers accounts for 76 % of the forests, while broadleaved species account for 24 %.

Natural share: status before settlement (several thousands years ago);

Recommended share – scientifically based on sustainable management ensuring community demand, economical benefit and ecological necessity.

Regarding altitude zones, basic characteristics of forest stands can be distributed as follows:

Forest altitude zone	Elevation above sea level	Average annual temperature	Annual precipitation	
Prevailing species / Unit	m	˚C	mm	
pine	Non-zonal			
oak, pine	< 400	> 8,0	< 600	lowlands, uplands
spruce, beech, oak, pine	400-550	6,5-7,5	650-700	uplands - highlands
spruce, beech, fire,	550-1000	4,0-6,5	700-1000	highlands
spruce	1000-1350	2,5-4,0	1200-1500	mountains
dwarf pine	> 1350	< 2,5	> 1500	

Main tree species and conditions suitable for tree growth

In general, fertile sites, especially of limestone and basalt, are not suitable for conifers as they often suffer with decay

Spruce (*Picea abies*)

- At 1050 m above sea level we can find climax mountain spruce stands

- At 400 – 1050 m above sea level we can find mixed stands with soil improving species, especially beech and larch. At this altitude spruce prefers acidic sites.

- At 600 -900 m above sea level we have optimum wood production

Pine (*Pinus sylvestris*)

- Up to 500 m above sea level, on sandy acidic soil sites, we can find pine trees

Beech (*Fagus silvatica*)

- Up to 1050 m above sea level, the area is covered by beach trees which prefer fertile sites.

- At 550 -900 m above sea level we have the optimum wood production

Pedunculate oak (*Quercus robur*)

- it grows in riparian forests and on stands enriched with water

Sessile oak (*Quercus petraea*)

- it grows in uplands up to 550 m above sea level, usually accompanied with hornbeam, linden, pine.

Other tree species in Czech forests:

Conifers: fir, larch, introduced Douglas fir

Broadleaved species: ash, maple, hornbeam, birch, aspen, linden, alder, poplar, willow

The most important commercial timber tree species in the Czech Republic are Norway spruce,

Scots pine, European beech, Sessile oak.

The most valuable wood is the so called resonance wood for musical instruments construction. The source of this material for musical instruments construction deriving from quality Norway spruce stands from mountain areas with slow increment

Exceptional types of forests in the Czech Republic:

These are floodplain forests, which are not too many, as well as riparian forests and stands next to water courses which are of great importance. Species found in these stands are: willows, black alder, ash, oaks, poplars, sycamore, Norway maple, elms. These sites are not suitable for conifers.

There are also Dwarf pine stands – which are only found in the highest altitudes (for example the Krkonoše national park).

Forest threats

(1) Industrial emissions

Since the middle of the 20th century until the 80's, pollution and extreme climate conditions were the key factors causing forests degradation, thus making them vulnerable to biological pests. Forests, especially in north-west Bohemia and along the mountain range of northern Czech borders, were damaged due to air pollution (caused by electric power plants using low quality brown coal) and acid depositions which, when reaching the soil, cause persistent stress on plants. Thus, industrial emissions cause serious damage to the Czech forests. Another serious problem is caused by oxides of nitrogen (NOx) emitted from vehicle engines which is the most serious damage of the Czech forests up to now.

(2) Other abiotic threats

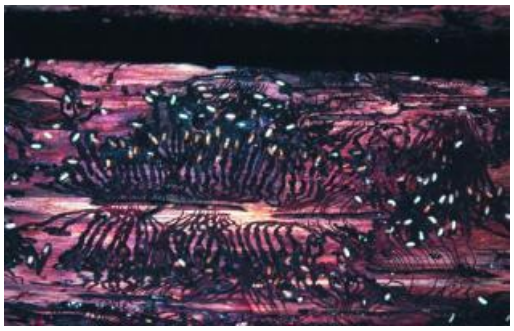
Abiotic factors are: rocks, soil, water, fire, wind, snow and frost.

For the past few years, one of the most serious abiotic threats for the forest is windstorms – e.g. Kyrill**,** during which in 2007, there were nearly 11 mill. m^3 trees fallen, while the annual increment in CZ is 16 mill. m3.

(3) Biotic threats – pests

Under normal conditions pests usually attack weaker trees which are more vulnerable because of weather conditions, air pollution, long dry periods or all of the above. For the past few years, insect

pests are the worst problem in the Czech Republic. Among the most common insect pests are bark Beetle, mainly spruce bark beetle (*Ips typographus*), nun moth, and tortrix.



Spruce bark beetle (VULHM archive)

Forest damage caused by Spruce bark beetle
(Stanislav Jansky)

Problems caused by game

Red deer, sitka deer, mouflon which are overpopulated in many areas disturb the ecological stability of forest stands. Stands are initially damaged by animals, later attacked by fungi and destroyed by fungal decay. For the past century deer barking and browsing have caused serious damage to the forests in the Czech Republic.

Forest Protection Service of Forest Research Institute is responsible for monitoring insect pests and the damage they cause all over the country. It also provides advisory services to all forest owners and managers for free.

Typical and exceptional fauna and flora species in forests – Czech Republic

Species composition and distribution of Czech forests altered in the past in an effort to increase the great demand for some tree species. As a result, today the share of coniferous species (76%) is higher compared to that of broadleaved species (24%). Forests are natural communities with a great

species diversity. Even the poorest forest is home to thousands of animal species. This means that forests are home to an enormous number of animals which are adapted to live both on the surface and inside the tree trunks, in tree blossoms, fruits or on treetops.

Typical fauna of the Czech forests

The most common animals in Czech forests are red deer, roe deer, wild boar, sitka deer, fallow deer, mouflons, wild boar, fox, brown hare, and pheasant.

Red deer (www.mezistromy.cz) *roe deer (www.mezistromy.cz)*

Sika deer (www.mezistromy.cz) *wild boar (www.mezistromy.cz)*

hare (www.mezistromy.cz)

Exceptional fauna in the Czech forests

We can mention capercaillie *(Tetrao urogallus L.)* and black grouse *(Lyrurus tetrix L.),* which can be found in Šumava National Park


capercaillie = wood grouse *(Tetrao urogallus L.) – (www.mezistromy.cz)*
black grouse = heathcock *(Lyrurus tetrix L.) - (www.mezistromy.cz)*


wolf *(Canis lupus L.) – (www.mezistromy.cz)*
brown bear *(Ursus arctos L.) - (www.mezistromy.cz)*

Wolf and bear which are priority protected species found in the Beskydy Mts. (Natura 2000 SPA area), in the North East part of the Czech Republic near Slovakian borders.

Typical flora in the Czech forests

(1) Acidic soil sites

We can mention Pine stand with blueberry *(Vaccinium myrtillus L.).*


Pine stand with blueberry *(Vaccinium myrtillus L.) – (UHUL Plzeň archive)*
blueberry *(Vaccinium myrtillus L.) – (www.mezistromy)*

(2) Fertile sites

We can find woodruff *(Galium odoratum)*

woodruff *(Galium odoratum) – (www.mezistromy.cz)*

Forms of nature protection such as national parks and Natura 2000 sites - Czech Republic

Some of the forests are within special protected areas designated according to legislation. Total forest area in special protected areas (SPA) accounts for 28.4 % of the total forest area in the Czech Republic. Forests are really important in terms of biological diversity and in terms of the elements of the natural habitat they preserve.

National Parks (NP)

NPs are protected areas with the highest protection level. State administration is responsible for the environment in these areas.

NP name	Basic characteristic	Year of creation	Area
Krkonoše NP KRNAP	**The highest mountains, glacial phenomena (corries, moraines), important mountains geobiocenosis with a lot of endemits; important damages by air-pollution; in highest expositions are dwarf pine stands.**	1963 (1991)	36 200 ha
NP Podyjí	Dyje river canyon with important geobiocenosis; important archaeological localities.	1991	6 300 ha
NP Šumava	**National Park Sumava on the border with the Federal Republic of Germany and National park Bavarian Forest. Old mountains with glacial lakes, continuously forested, with peat bogs, lynx reintroduced in 1980ties; protection of ecosystems and landscape nature of montane forest, important damages by windbreaks and bark beetle outbreaks.**	1991	68 500 ha
NP České Švýcarsko	Sandstone hilly country on the Labe river right bank in Děčín region; rock formations and ample original forest ecosystems.	1999	7 900 ha

Natura 2000

At present, in the Czech Republic there are 1087 Special Areas of Conservation (SAC), accounting for 9% of the country's territory and 41 Special Protected Areas for birds (SPAs), accounting for 10% of the country's territory.

Natura 2000 priority protected species in the Czech Republic:

Mammals
Wolf *(Canis lupus L.)*
Brown bear *(Ursus arctos L.)*

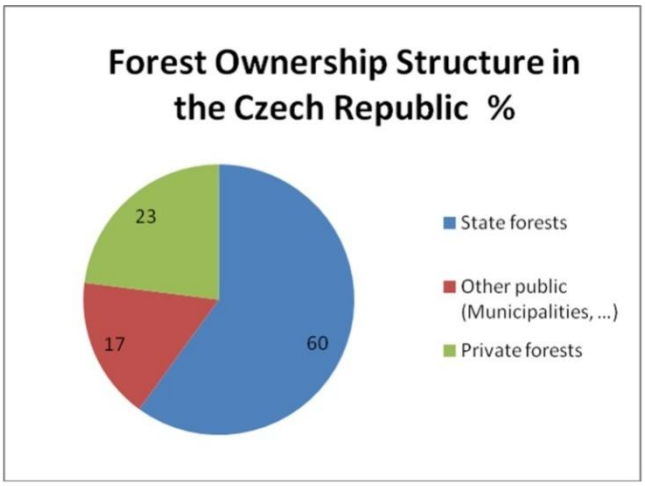
Crustaceans

Crawfish *(Austropotamobius torrentinum L.)* – *(Lenka Janoušková)*

Crustacean of smaller watercourses can be found.

Beetles *Osmoderma eremita L.* – live in rotten wood in old trees holes, especially in landscape alleys (oaks), in riparian trees (willows) but also in old oaks in forests.

Organization of Forestry - Czech Republic



For 6.5 % of forest we don't know if it is Church property. The percentages of forest ownership are the following:

State forests: 60 %

Private forests: 23 %

Municipalities: 17 %

State Enterprise (LCR, s. p.) manages most of the state forests (51% of the total). LCP s.p., according to the Czech Government's decision, is responsible for the implementation of all forestry works (cutting, planting, silviculture, road maintenance) on the basis of long term contracts only with big forestry entrepreneurs.

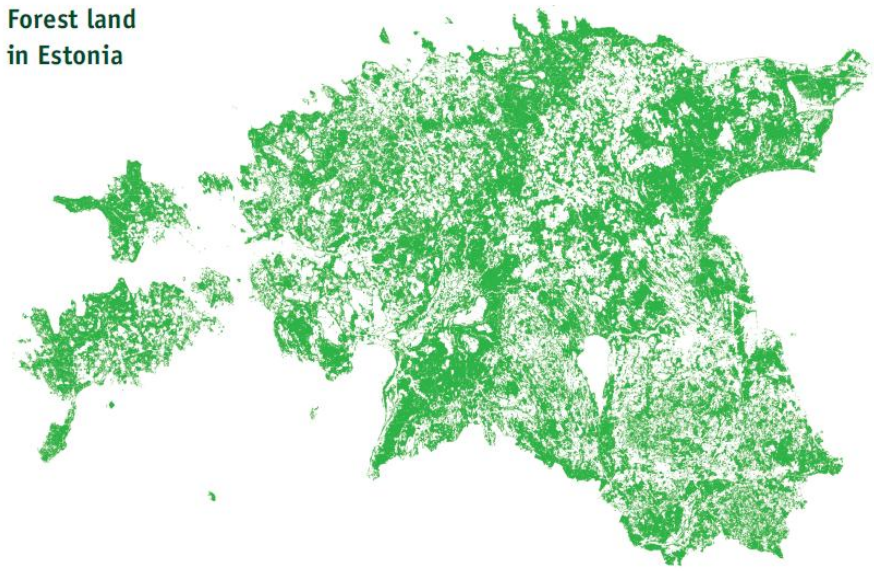
The major non-state forest owners have established a voluntary professional organisation - the Association of Municipal and Private Forest Owners in the Czech Republic (SVOL) which is a very important organization and respected partner of the Ministry of Agriculture, Ministry of Environment and other partners contributing to the development of forest policy in the Czech Republic. SVOL organises seminars and excursions for its members, disseminates on a regular basis professional information for them and also organizes timber sales.

According to Forest Law, all Czech forests are accessible to the public (everybody can enter the forest, with his own responsibility). However, there are restrictions regarding access to sensitive areas such as forest nurseries, game reserves, research areas, animals' natural habitats water springs and Special Protected Areas (SPAs). There can also be temporary restrictions on forest access (e.g. during periods of fire risk, during works in the forest).

A Forest management plan (FMP) is obligatory for all forest owners with a forest property over 50 ha. Small forest owners can get forest management guidelines free of charge, or otherwise they follow a forest management policy according to the Forest Act. FMP is very useful to the forest owners including all the necessary guidelines to be followed regarding forest management (afforestation, tending, felling) and it is valid for a period of 10 years**.**

Forest characteristics and forest types - Estonia

Estonia is located in North Europe on the eastern coast of the Baltic Sea. The country's relief is mostly flat or slightly hilly, with an average height of 50 metres above sea level. The country's highest point is 318 metres.



Inland ice melted 10.000 years ago forming the present landscape. The ice left behind sediment or moraines of different thickness and consistency. Because of that, growth conditions vary enormously. Despite the country's small size, 26 forest types can be distinguished.

Bogs cover ~5% of Estonia

For the past thousand years, forests are mainly influenced by human activity. In Estonia forest cover was up to 80% of the country's territory but by the end of the 19th century it dropped to 30%. Forest loss was mainly due to the use of land for agricultural purposes.

The situation changed again after World War II. Until the mid-20th century Estonia was mostly an agricultural country, but agricultural reforms during the Soviet occupation left huge proportions of agricultural land out of use. These areas were then covered again with forests.

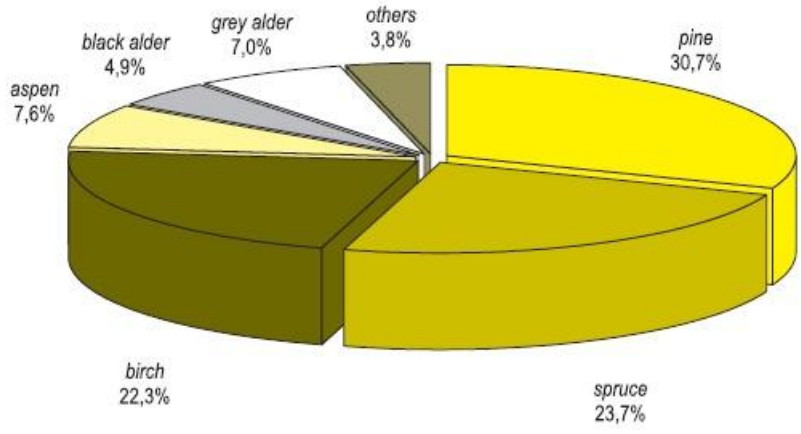
Today Estonian forest area accounts for approximately half of the country's territory. Compared with figures in 1939, the total forest area has increased by more than 50%, whereas annual increase is, on average, 12,000 hectares. The growing stock volume is 455 million m^3.

Typical and exceptional fauna and flora species in forests - Estonia

Flora

Based on the geographical distribution of plants, Estonia mainly belongs to the northern area of the nemoral-coniferous or mixed forests of the temperate zone. The proportion of dominant deciduous and coniferous forests is more or less equal, covering 51% and 49% of the total forest area respectively. 81% of forest land consists of 3 main species – Scots Pine (*Pinus sylvestris,* 29 %), Norway Spruce (*Picea Abies,* 23 %) and Silver and Downy Birch (*Betula pendula* and *Betula pubescens,* 22 %). 99,8% of the forests consist of native tree species.

There are 36 protected orchid species.

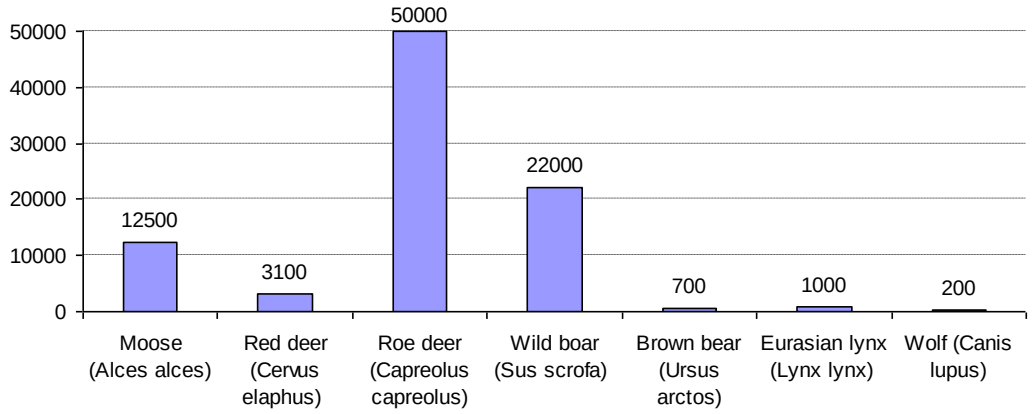


Distribution of growing stock by tree species.

Fauna

Estonia is rich in fauna. This is due to the location – on the northern border of temperate zone, close to the sea and to the vast forests of Russia.

An important part of forestry is game management – in order to preserve wild game resources. A total of 55 species are listed as game species: 18 mammal species and 37 bird species. Moose, wild boar and roe deer are the most important game species. Furthermore, the population of big game species is large enough for hunting.



Big game species

European mink *(Mustela lutreola)* is listed by the IUCN as Critically Endangered due to ongoing reduction. Its decline has been calcuated to more than 50% over the past three generations and it is expected to decline at a rate exceeding 80% over the next three generations. In Estonia its reduction seems to coincide with the spread of the American mink. European mink now exists only on the isolated island of Hiiumaa where it has been reintroduced since 2000 and from where the american mink was removed) .

European mink (Mustela lutreola) – endangered species in Estonia.

Forms of nature protection such as national parks and Natura 2000 sites - Estonia

Conservation of forest communities in Estonia dates back to the first millennium A.D. Ancient Estonian believed in the spirits of nature and considered old forests to be sacred. Big oak and lime trees were considered to be sacred trees and people turned to them for help. It was strictly forbidden to harm those trees in any way. The first dated act of forest protection was in 1327, when Danish King Erik Menved forbade felling on three small islands in Tallinn Bay in order to maintain them as maritime navigation landmarks. Forests have mainly been used for the protection of marshlands, nature sites or landscapes.

On 14th August 1910, the Riga Association of Naturalists rented Vaika bird islands, in order to ensure safe nesting opportunities for local birds and prevent the collection of eggs. Thus, the first nature conservation area in the Baltics was established.

Today 1/5 of Estonia is covered with different protection areas. Among these, about 5% are strictly protected areas.

There are 5 national parks: Lahemaa – the biggest, Karula – the smallest, Soomaa, Vilsandi and Matsalu.

In 2010 Estonian Natura 2000 network consisted of 66 bird sites and 531 habitat sites of community importance. Most of the birds sites are also habitat sites and thus the total area accounts for about 30 % of Estonia.

Natura 2000 areas

Organization of Forestry - Estonia

Regarding ownership Estonian forests are divided into three categories:

1. *State forests,* which are managed by The State Forest Management Centre (RMK). State forests are divided into 17 forest districts and are used for commercial and nature protection purposes. RMK also creates and supports recreational facilities. State forests account for approximately 40% of our forests.

2. *Private forests,* which are managed by private owners. They account for about 45% of the forests. There are about 100.000 private forest owners and the average size of forest property is 10 ha.

3. Unidentified forest ownership amounts to 15% of forests. This land was former private land which was nationalised during the Soviet Union occupation. Until today potential owners have not claimed it yet. As a rule, for the past 15 years this land has not been managed. These forestlands are either added to the state forest or sold at the auctions.

About 70% of Estonian forests are managed. Forest act on forest management is very strict. For example a forest must be restored within 5 years after clearcuttings and there is a minimum cutting age for tree species (for Scots pine it's 90 years). This ensures suistainability in forestry.

Forests are important for timber production, nature conservation and recreation. 1 out of 15 Estonian people work in Forestry.

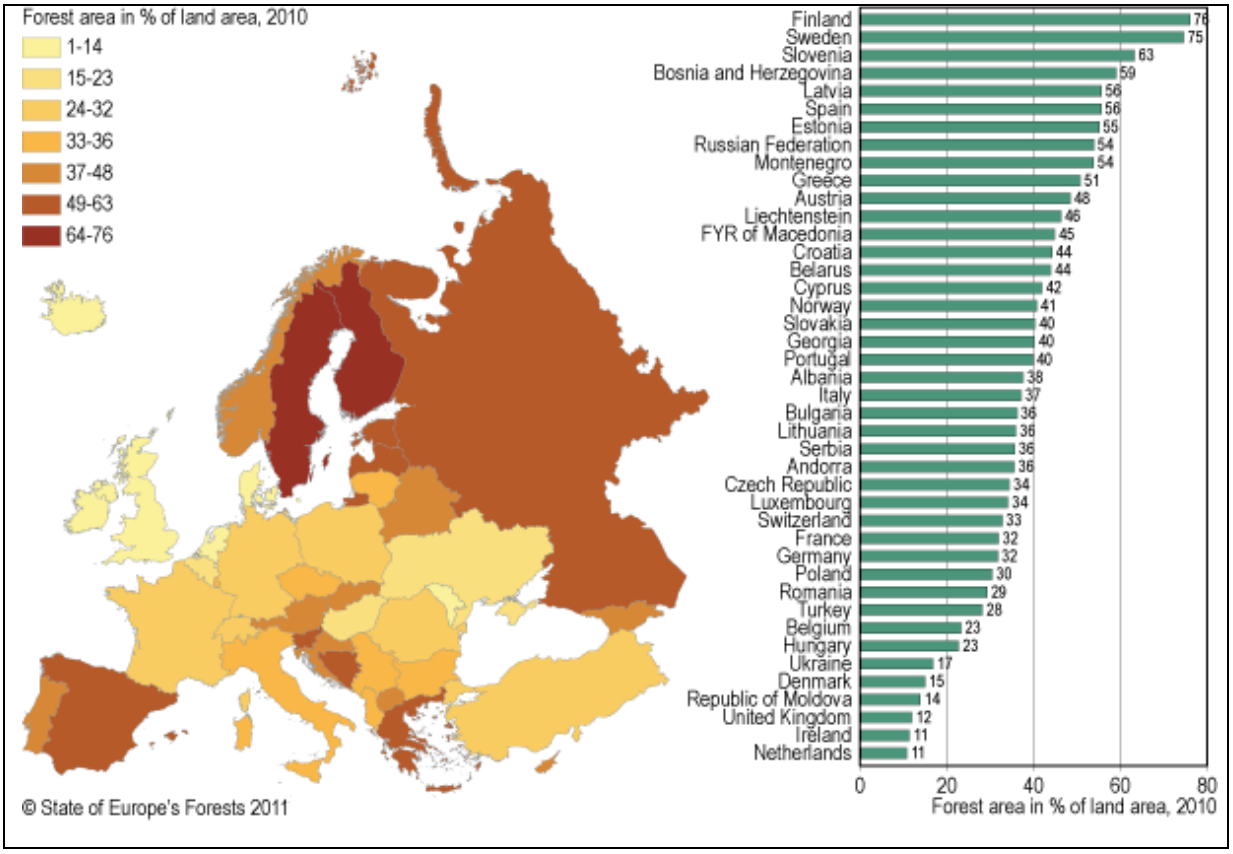
Forests are mainly threatened by storms, fungi, insects and fire. 99% of fires are caused by humans.

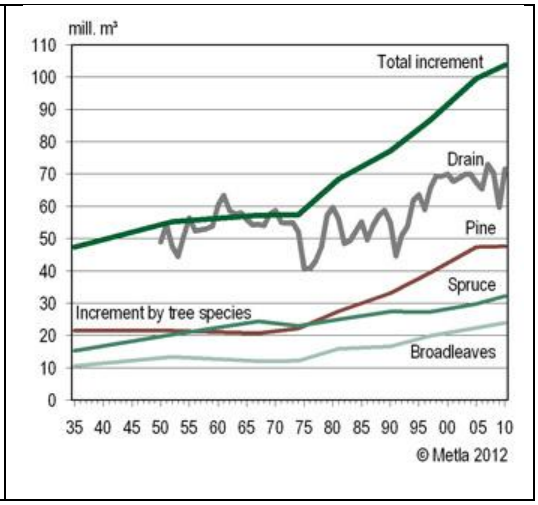
Forest characteristics and forest types - Finland

Geographically, Finland lies in an intermediate climate zone between maritime and continental zone, with its largest part in the boreal vegetation zone. As Finland is over 1,100 km long on the north-south axis, conditions for forest growth vary considerably between the southern and northern parts of the country.

Forest is Finland's most significant renewable natural resource. Finland's forests are managed in a sustainable way. The basic objective of sustainable forest management is to ensure the continuity and profitability of wood production and at the same time care for the biological diversity of forests and forest products and services.

Forest cover in Finland is more extensive than in any other European country. Over 86% of the land area is forested. Of the total forest area in Finland, 71% is under private ownership (including forests belonging to the Finnish forest industry companies, municipality, parish). The Finnish State owns 29%.





Picture 1 (top). Forest cover in Europe, as percentage of land area. Source: Forest Europe 2011.
Picture 2 (down left). Finnish forest and water landscape. Photo: Metla/Erkki Oksanen.
Picture 3 (down right): Annual increment of growing stock (1935–2010) and annual drain (1950–2010). Sources: Finnish Forest Research Institute (Metla), National Forest Inventory and Forest Statistics Information Service.

Towards the north, the climate gets increasingly colder and more humid. The annual growth period in southern Finland is about five months whereas in the north it is three months. The growing stock volume in Finland amounts to 2,284 million m^3. The average increment of growing stock in Finland is about 5 m^3/ha/year. The annual increment of the growing stock in Finland is over 103 million m^3.

Half of the growing stock consists of Scots pine, 30% of Norway spruce, and 20% of broadleaved species (mainly birch).

Typical and Exceptional fauna and flora species in forests - Finland

The number of plant and tree species in Finnish forests is small compared to the boreal zone in North America, or the temperate zone in Central Europe. This is because of the high European mountain ranges running east-west, which prevented the return of plants to the north after the last Ice Age about 10 000 years ago.

There are only four coniferous tree species native to Finland, and fewer than 30 deciduous trees and arborescent shrubs. The majority of forests in Finland are predominantly coniferous forests, with broadleaved species often growing in mixed stands. Mixed forest stands and predominance of broadleaves are common in mineral soil sites and upland forests with grass-herb vegetation. The most common species growing in mixed stands is downy birch.

Scots pine predominates on 67% of forest land, spruce on 22% and broadleaves on 11%. Broadleaves, which are important to forest biodiversity and soil, grow mostly in mixed stands. Their growing stock volume accounts for 20% of the total volume, which is clearly more than the volume of predominantly deciduous stands.


Picture 4 (left). Finnish birch forest. Photo: Metla/Erkki Oksanen.
Picture 5 (right). Moose (Alces alces). Photo: Metla/Erkki Oksanen.

Several carnivores can be found in Finland's forests such as brown bear, wolf, lynx and wolverine. Game and reindeer management in Finland is practiced within the limits permitted by the sustainable use of natural resources. The most common game animals are elk, hare, grouse and water fowl. The authorities and local game management associations in Finland set the framework for the management and various uses of the game's habitat.

Forms of nature protection such as national parks and Protected forest areas and Natura 2000 - Filnand

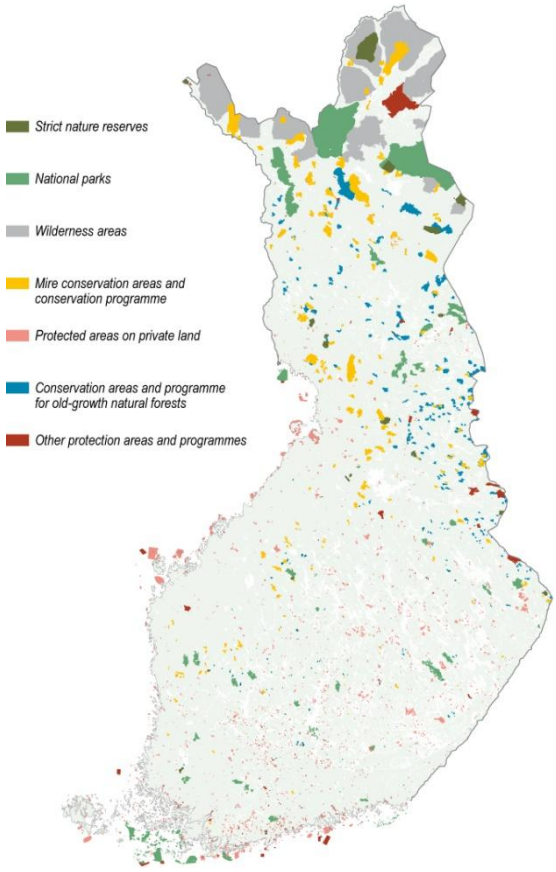
The establishment of statutory conservation areas in Finland has been based on conservation programmes for national parks, strict nature reserves, mires, waterfowl habitats, eskers, herb-rich forests, shorelines and old-growth.

When compared with other European countries the share of strictly protected forests in Finland (5.2% of forests) is the highest in Europe. This accounts for over 13% of Finland's total forest area. The majority of protected forests are in northern Finland. Due to many protection programmes and decisions, protected forests have increased three-fold in Finland over the past 30 years.

The first national parks and nature reserves in Finland were established in 1938. There are currently 37 national parks, 19 strict nature reserves and 12 wilderness reserves.

In 2002, the Finnish Government adopted the Forest Biodiversity Programme for Southern Finland (METSO) with the aim to improve the conservation of habitats and structural characteristics of forests, which are vital to the survival of endangered species in private forests. New areas and networks that support forest biodiversity are established and the biodiversity of existing conservation areas is improved. The principles of new protection methods are: voluntary participation of forest owners, maintaining ownership and full compensation for economic losses.

The Natura 2000 network safeguards the biotopes and habitats of species defined in the Habitats and Birds Directives of the EU 27. The EU Natura 2000 network in Finland included 1.860 protected sites, ¾ of which are terrestrial areas. The majority of the Natura 2000 areas, 97%, are nature conservation areas established under national decisions. These areas can also be part of national conservation programmes or can be protected in other ways.



Picture 6 (up left). The natural characteristics of habitats of special importance, such as this spring, which must be preserved during silvicultural works and wood cuttings. Photo: Metla/Erkki Oksanen
Picture 7 (down left). Deadwood is left in the forests in wood cuttings. Deadwood helps the survival of certain species (e.g. woodpeckers) on the site across tree generations. Photo: Metla/Erkki Oksanen
Picture 8 (right): Nature conservation areas in Finland. Source: Metla/Finnish Statistical Yearbook of Forestry 2011.

Biodiversity of Finland's forests is also affected by the way commercial forests are managed. In commercial forests, biodiversity is promoted, for example, by maintaining valuable habitats, increasing the amount of deadwood, and saving large broadleaved species in cuttings.

Organization of forestry - Finland

In Finland the obligation to restore the forest after wood cuttings has been the basic principle of the law since the beginning of 1900 and until today. The Government encourages forest owners to use sustainable silvicultural practices in forest management. State subsidies are available for ensuring sustainable wood production, forest biodiversity and improvement of the forests' health.

Picture 9 (left). Forest thinning in Finland. Photo: Metla/Erkki Oksanen
Picture 10 (middle): Collecting mushrooms and berries for private consumption is common in Finland. Photo: Metla/Erkki Oksanen
Picture 11 (right). Wooden construction. Metla House in Joensuu, Finland. Photo: Metla/Erkki Oksanen

Using forests for sawn timber and paper products began in the late 19th century. Nowadays forestry and forest industries account for approximately 5% of the Gross National Product. Compared to its size, Finland is more dependent on forests and forest industry than any other country in the world. As a consequence, Finland has accumulated an expertise in forestry and industrial manufacturing of forest products which is unique in Europe.

The importance of forestry and forest industry as a source of employment continues to be an important factor in maintaining the vitality of rural areas and regional economy. In 2010 forestry and forest industry employed about 3% of the total workforce in the Finnish national economy, ¾ of that percentage work for the forest industry.

Forest-related services and the use and maintenance of non-wood products are an important part of forest management in Finland. Everyman's Right gives universal right and opportunity to use forests for recreation, outdoor activities and collecting berries and mushrooms, as far as this causes no damage or disturbance.

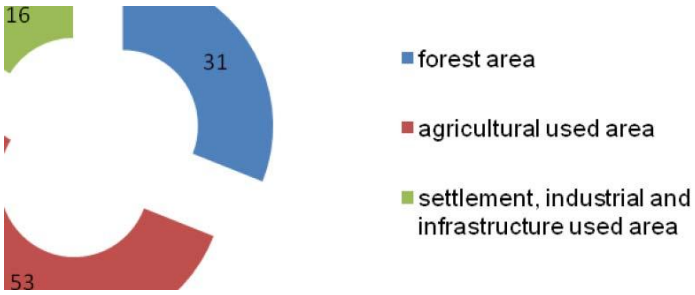
One of the future challenges of Finland's forest ecosystems is climate change. According to the latest studies the annual mean temperature is predicted to increase by 2–6 degrees by the end of 2100. Expected effects on forests are for example: growing season is likely to lengthen, forest growth may increase wind and insect damage will become more frequent. Sustainable forest management is the best way to improve the ability of forests to adapt to climate change. In Finland great emphasis has been given to the mitigation of climate change by promoting the use of wood. These actions include increased use of wooden construction and wood-based bioenergy. In 2010 wood-based fuels provided 22% of Finland's total energy consumption, one of the highest figures within the EU 27.

Forest characteristics and forest types - Germany

Germany is located in the temperate zone. Geographically Germany is divided into the northern German lowlands, the low mountain range, the footihills of the Alps and the Alps. Because of these various conditions there is a natural diverse forest structure in Germany. Originally, there were deciduous forests and mixed deciduous with coniferous forests in the mountain regions. Because of human intervention the area changed a lot. Forest was always used as a resource (for example for building materials and fuel) and therefore typical productive forests were developed.

An overview 10 km north east from Berlin (Stephanie Gotza)

Today, Germany is one of the richest countries of Europe in wood production. In total, forest area covers approximately 31% of the country's territory.



Amount of Forest Area in Germany in % (Holzabsatzfonds, 2006)

This forest area (31%) consists of 2/3 of softwood and 1/3 of hardwood.

Typical picture of a coniferous forest and hardwood (Stephanie Gotza)

For more than 200 years sustainable forest management has been implemented in Germany. Sustainable forest management can influence forest structure in a positive way and sometimes it even has positive effects on the natural structure. The principle of sustainability is anchored in the Federal Law on Forests and the States Law on Forests. Hans Carl von Carlowitz was the founder of the principle of sustainability. In his book "Sylvicultura oeconomica“ (1713) he presented the assumption that food harvest should be in direct balance with growth. This assumption is still valid today.

A typical Winter Scene in Waren an der Müritz, Germany (Stephanie Gotza)

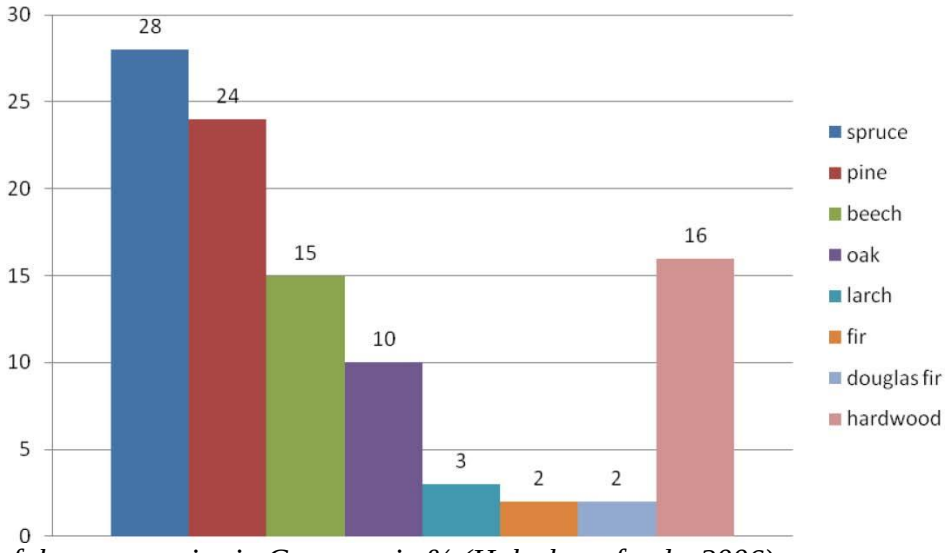
Typical and exceptional fauna and flora species in forests - Germany

In the past the original forest vegetation – hardwood – accounted for nearly 80 % of the total forest area.
The most typical tree species was the beech.

In general, today forest area in Germany can be divided into:
1. the rich pine in north Germany
2. the rich hardwood in the low mountain range of Germany
3. the rich spruce in south Germany
4. the coast area in Germany.

Low mountain range south of Cologne (Stephanie Gotza)

Today 71 tree species can be found in Germany. The main tree species are spruce *(Picea abies-28%)*, pine *(Pinus Sylvestris-24%)*, beech *(Fagus sylvatica-15%)* and oak *(Quercus ssp.-10%)*.



Distribution of the tree species in Germany in % (Holzabsatzfonds, 2006)

For the past 30 years, forestry in Germany follows the "close to nature forest management". As a result German forest has changed and gradually rich softwood sites have been transformed into mixed hardwood sites. Today hardwood and mixed forests amount to 39 %.

But what is the future of the German forest? Global Warming, especially the rise in the average annual temperature, will influence the forest ecosystems too. Within the next 100 years, more hardwood than softwood trees will grow. Of great importance are the non-native tree species, for example Douglas fir, Japan larch, American red oak, and Robinia. Non-native species account for 4 % of the total forest area in Germany.

A special tradition is the Tree of the Year. Every year one tree species is chosen. For the past 20 years the foundation "BAUM DES JAHRES – Dr. Silvius Wodarz Stiftung" chooses and promotes one special tree species every year. The goal is to inform the public about the chosen tree. For the year 2011 the chosen tree was service tree (*Sorbus torminalis*).

59*Otter in the Schorfheide, Germany (Astrid Schilling)*

Mammals in the German hardwood forest are martens, fallow deer, red deer, boars, lynxes, foxes, beavers and otters. In 1998 wolves were detected in the Lausitz. Until then there had been detected: only 5 packs of wolves (about 25-50 wolves in total) and one pair of wolves in the Lausitz (Saxony), and one pack of wolf and one pair of wolves in the Lausitz (Brandenburg).

Forms of nature protection such as national parks and Natura 2000 sites - Germany

The Bayerischer Wald National Park was founded in 1970 as the first national park in Germany. Today there are 14 national parks in exciting landscapes in Germany (see figure below). Of special interest is the glacial shaped floodplain in the Unteres Odertal National Park at the borders between Poland and Germany.

National Parks in Germany (green areas) (Lencer, 2008) (http://www.bfn.de/0308_nlp.html)

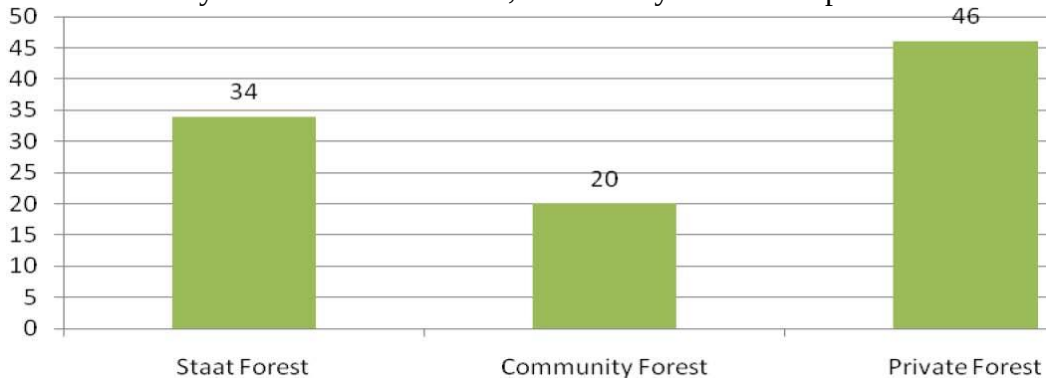
National parks cover 0.54 % of the federal territory. In 2004 two new areas were designated as national parks in the western part of Germany. Eifel and Kellerwald-Edersee National Parks are mainly forest ecosystems. Until then forest ecosystems were underrepresented among the German national parks. 5 % of the forest areas in Germany are Nature reserves. The emblem for a nature

reserve is a black owl on a yellow background which was invented by the East German conservationist Kurt Kretschmann in 1950. Schorfheide nature reserve is one of the largest contiguous areas of forest in the eastern part of Germany, about 65 km away from Berlin.
In Germany Natura 2000 was incorporated in the Federal law in 1998. Germany has reported so far 4.621 species and habitat protection areas, found in three bio geographical regions (Alpine, Atlantic and Continental).

Moss on deadwood near Eberswalde, Germany (Astrid Schilling)

Organization of Forestry - Germany

The Federal Law on Forests and the States Law on Forests guarantee the sustainable forest management. In Germany there are: State forests, community forests and private forests.



Ownership of forest area in Germany in % (Holzabsatzfonds, 2004)

In 2009 the annual logging in Germany was more than 48 million m^3 (without bark). In Germany the per capita consumption of wood amounts to 1.15 m^3. In most Federal states state forest is managed by regional forest offices. Forest offices are responsible for forest district of about 1,500 to 3.000 hectares which are managed by foresters. The main task of the forest offices is sustainable forest management which includes production, harvesting and marketing of wood and non-wood products and at the same time guarantees the protection and recreational function of the forest in these areas.

Young foresters in Eberswalde, Germany (Astrid Schilling)

Old Forest academy in Eberswalde, today HNE Eberswalde (Astrid Schilling)

In Germany about 1.2 million people work for the forest, for instance, in forest offices, in research institutes, in sawmills and in the paper industry. These people are organised in various professional and interest groups such as Bund Deutscher Forstleute (BDF) and Schutzgemeinschaft Deutscher Wald (SDW). The SDW was founded in 1947 and is the oldest citizens' initiative in Germany. In Germany there are four Universities where we can study Forest Sciences. There are also five Universities of Applied Sciences where we can study Forestry. There the education is more practice-oriented.

German forest as a romantic landscape was already described from the beginning of the 19th century. We can read about it in poems, legends and fairy tales, like “Little Brother & Little Sister”. Whereas in those days Hansel and Gretel got lost in the dark forest, nowadays forest is an ideal place for people’s health, recreational activities and educational activities such as Forest Education and forest kindergardens. Today Forest education is one of the main tasks of a German forester.

Listen to the silence of the forest. Near Potsdam, Germany (Astrid Schilling)

12 years old pupils during the measurement of tree heights. Britz, Germany (Astrid Schilling)

Winter landscape close to Altkünkendorf, Germany (Stephanie Gotza)

High-school students from Berlin are callipering a trunk diameter. Eberswalde, Germany (Astrid Schilling)

Forest characteristics and forest types - Greece

Greece is located at the southern edge of the Balkan Peninsula. The country's topography is mostly mountainous. There are small plains and valleys between the mountains and they are the main agricultural areas.

The climate is typically Mediterranean over most of the country, with warm-to-hot summers and mild winters. Usually there is little or no rain in the summer, but quite often the dry season may start as early as April and finish in fall.

Southeastern Greece, including the area around Athens and the Cyclades Islands in the Aegean Sea, has annual precipitation of less than 400 mm, which is one of the lowest in Europe.

Average annual temperature varies between 14.5°C in the north and 19.5°C on the southernmost island of Crete. Absolute minimum temperatures at high elevations in northern Greece may approach –25°C. In the summer, maximum temperatures occasionally reach 42-45°C at various inland locations. The influence of the Mediterranean Sea that surrounds the country on three sides helps to moderate the air temperature in most areas.

In Greece, forests and woodland account for 49% of the country's territory, 57% of which are deciduous and 43% conifers. The main tree species are: *Quercus sp.*, *Pinus halepensis*, *Abies sp*. and *Fagus sp*.

The forest cover in Greece is low. Nevertheless, Greece has a significant diversity of forest ecosystems. This diversity is due to the rich flora, the diversity of climate types, the diversity of geological formations and rocks, the existence of peninsulas and islands (Greece has 42 peaks over 2,000m high), the geographical position of the country among 3 continents and the historical, economic and social changes.

Attempts have been made to categorize Greek vegetation in discrete altitude zones:
- the thermo-mediterranean (up to c. 400 m)
- the meso-mediterranean (c. 400-700 m)
- the supra-mediterranean (c. 700-1 800 m)
- the montane Mediterranean (c. 1 800-2 200 m)
- the supra-forest zone (c. 2 200-2 917 m)

Mediterranean evergreen forest. At low altitudes, the dominant species of evergreen broadleaved are *Ceratonia siliqua, Pistacia lentiscus, Olea europaea, Arbutus sp., Quercus coccifera, Quercus ilex, Erica sp.*.

Forests of *Pinus halepensis*, *Pinus brutia, are found* in patches in the coastal lowlands and occasionally up to 800m high. The forests are rather open, and have a shrub layer of evergreen species, such as *Juniperus phoenicea, Quercus coccifera, Phillyrea latifolia, Calicotome villosa, Erica arborea, E. manipuliflora. Cupressus sempervirens* is native in Crete and the East Aegean islands.


Macchie or maquis. The term “macchie” or “maquis” is used to describe a dense sometimes impenetrable, scrub vegetation, generally 1.5-3.5 m tall which is mainly composed of hard-leaved evergreen species such as *Quercus ilex, Arbutus unedo, A. adrachne, Laurus nobilis, Myrtus communis, Erica arborea, Pistacia lentiscus, Phillyrea latifolia*.

Macchie also is composed of some deciduous shrubs such as *Cercis siliquastrum, Cotinus coggygria, Ostrya carpinifolia*and *Pistacia terebinthus*.


Phrygana. The term "phrygana" is used for an open dwarf shrub dominated by low, often cushion-shaped, aromatic, spiny or grey-leaved shrub. In islands and degraded evergreen broadleaved forests, (as a result of long and frequent fires) there are areas covered by “phrygana”, with

dominating species of *Cistus sp., Sarcopoterium spinosum, Coridothymus capitatus, Euphorbia acanthothamnus, Saturejia sp., Anthyllis hermanniae, Micromeria juliana.*

Deciduous forest. *Quercus pubescens* and *Q. frainetto* are the most widespread species of deciduous oaks generally occurring in the hills and lower mountain slopes between 300 and 800m high, in the more continental parts of the country. Other deciduous trees and shrubs commonly found in this zone are *Q. cerris, Ostrya carpinifolia, Carpinus sp., Fraxinus sp., Acer sp., Coryllus sp., Tilia sp., Aesculus hippocastanum.*

Well-developed natural forests of *Castanea sativa* occur locally in central and northern Greece.

Montane coniferous forest. Large coniferous forests, dominated by either *Pinus nigra*, or by *Abies* occur on the mainland at altitudes between 600 and 1,800m. The genus *Abies* is represented by the endemic *A. cephalonica* in the south, *A. x borisii-regis* in central Greece, and *A.alba* locally in the north. *Pinus sylvestris* forms forest locally on non-calcareous mountains in the north.

In the same zone, broadleaved deciduous *Fagus sylvatica* and *Fagus orientalis* form pure stands on the richer and deeper soils.

Montane Mediterranean

In higher altitudes, over 1,800 m., there are forests such as *Juniperus foetidissima* and *Pinus heldreichii.* In northern Greek borders and at medium altitudes, we can also find forest sections of *Betula pendula, Larix decidua, Pinus peuce* and *Picea abies species*.

Subalpine and alpine communities. The timberline is generally formed by *Pinus* or *Abies*, in northern Greece sometimes by *Fagus*, and on Crete by *Cupressus*. Over 2,000-2,200 m high the areas are covered with species of low-growing shrubs such as *Juniperus communis ssp. nana,Astragalus sp., Daphne oleoides, Acantholimon echinus, Arctostaphylos uva-ursi, Vacinium sp.*.

Lowland cliff vegetation. Limestone cliffs and to some extent also cliffs of siliceous rocks, especially in the Aegean region, are of great botanical interest, with a characteristic flora called "chasmophytes". The chasmophytes are generally long-lived, woody-based perennials.

Riparian vegetation. Streambeds at low altitudes are generally lined by trees of *Platanus orientalis, Nerium oleander, Vitex agnus-castus* and at higher altitudes *Salix sp., Alnus glutinosa, Fraxinus angustifolia, Populus sp.*.

The distribution of the areas for the main forest species is presented in the below *Table* .

Species	Area (1,000 ha)	Percent (%)
A. Coniferous		
Fir	543.3	16.17
Aleppo Pine, Calabrian Pine	567.7	16.90
Black pine	281.7	8.39
Scots pine	21.0	0.62
Pinus leucodermis	8.3	0.25
Stone Pine	0.1	0.003
Spruce	2.8	0.08
Other coniferous	5.2	0.15
Total coniferous	**1,430**	**42.57**
B. Broadleaved		
Beech	336.6	10.02
Chestnut	33.1	0.99
Oak	1,471.8	43.82
Plane tree	86.6	2.58
Other Broadleaved	0.8	0.02
Total broadleaved	**1,929**	**57.43**
Total forest area	**3,359**	**100.00**

Distribution of the areas for the main forest species

Typical and exceptional fauna and flora species in forests - Greece

Flora

In Greece there are about 6,900 species and sub-species of vascular plants. Endemic species and sub-species in Greece are over 1,300. Flora diversity is the result of a number of factors, the most important being:

- Old flora containing many Tertiary species which have survived the Quaternary Ice Ages.
- The existence of islands, mountain ranges, isolated land masses, as a result of geological change in the Mediterranean Sea.
- The fact that flora in Greece is influenced by central European, Anatolian and Pontic flora.
- Human intervention and domestic animals which destroy and change natural vegetation.

Fauna

Fauna in Greece has a great diversity because of the many forest types ranging from mountain habitats of dwarf pines to coastal gallery forests. It is actually a mixture of European, Asian and African species. It includes bears, wild cats, brown squirrels, jackals, foxes, deer, wolves, lynxes, as well as the rare species of wild-goat, which inhabit the mountain regions of Crete. In Greece there are about 116 mammal species, 57 of which belong to IUCN endangered species categories. For ensuring game populations, 700 wildlife refuges were established. 422 bird species have been recorded, 2/3 of which are migratory birds. Forests are habitats for many insect species which are rare or protected by nature conservation legislation. Many insects have not been described yet, especially endemic ones. Greek entomofauna is estimated at about 50,000 species. Of particular importance are insect species that inhabit dead wood and those living in the trunks and hollows of trees in primary forests. Many animal species depend on the rich entomofauna.

Moreover, there are many endangered species because of widespread urbanization and tourism.

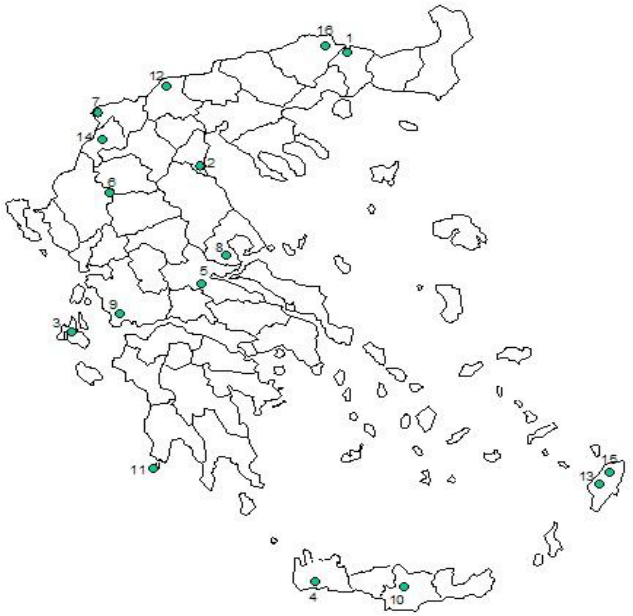


Forms of nature protection such as national parks and Natura 2000 sites - Greece

In Greece there are four forms of nature protection:

1. **Ancient semi-natural forest types**

They include 16 regions that were integrated into the European network of biogenetic reserves.



LEGEND
Location of ancient seminatural forest types
1. Trahaniou Xanthi - Virgin forest
2. Core area of Olympos - National Park
3. Core area of Ainos - National Park
4. Core area of Samaria - National Park
5. Core area of Oeti - National Park
6. Core area of Pindos - National Park
7. Core area of Prespes - National Park (Forest of

Juniperus foetidissima)
8. Kouri-Almyros - Forest
9. Lecini of Etoloacarnania - Ash stand
10. Zaros Iraklio of Crete Canyon - "Rouva" Forest
11. Sapienza island of Messinia - Forest of evergreen broadleaves
12. Promahona Likostomou Arideas - Stand sections of Pinus peuce
13. Emponas of island Rodos - Natural cypress forest
14. Gramos-Vitsi of Kastoria - Ancient forest stands
15. Profitis Elias of island Rodos - Forest
16. Paranesti Drama - Virgin forest

2. Strictly protected forest reserves

In Greece, there are 10 National Parks, 19 Aesthetic Forests and 10 Wetlands.

Category	Number	Total area (1000 ha)	Area of forest and other wooded land (1000 ha)
National Parks	10	110	93.5
Aesthetic forests	19	33	24.7
Wetlands	10	96	24.0
Total	***39***	***239***	***142.2***

3. Forest and woodland under a special management regime

In Greece, there are 14 Protected Natural Monuments, 10 Controlled Shooting Areas, 20 Game Breeding Stations and 700 Wild Life Refuges.

Category	Number	Total area (1000 ha)	Area of forest and other wooded land (1000 ha)
Protected Natural Monuments	14	16.5	14.0
Controlled shooting Areas	10	150.0	127.0
Game Breeding Stations	20	3.2	3.2
Wild Life Refuges	700	950.0	807.5
Total	***744***	***1,119.7***	***951.7***

4. Natura 2000 sites

Nowadays in Greece there are 262 NATURA 2000 sites. These areas cover 22 % of the total territory and are divided into three main categories:

1. Mountainous and inland NATURA 2000 sites which are far from coasts and wetlands.
2. NATURA 2000 wetlands such as lakes, lagoons, rivers, swamps.
3. Island and coastal NATURA 2000 sites.

Each of the above categories includes all types of habitats as well as rare and protected flora and fauna according to the EU Directives.

In Greece there are Special Protected Areas and 240 Sites of Community Importance. Some of the above sites overlap.

Organization of Forestry - Greece

The contribution of the forest sector to the country's GDP is low. The main reasons for that are: small percentage of economic (productive) forests, low productivity of economic forests and the fact that the value of non wood forest services cannot be estimated in economic terms.

In Greece state forests account for 74%, whereas 26% are non state forests. The growing stock of the productive forests is 158 million m^3.

Forestry in Greece is based on sustainable forest management. Greece established the principle of sustainable forest management in the Forest Law in 1928. Since then sustainable forest management has been implemented in forestry. Management of all forests is based on forest management plans which are valid for a period of 10 years.

Except for Forest Service, Forest Cooperations also participate in forest management and exploitation. In forest industry 700 industry units are involved in which 13,000 employees work. In Greece many people are involved in hunting whereas many professions are related to it.


The main body for protecting and managing the country's state forests as well as for supervising the private forests, is the Forest Service. This body operates under the name Special Secretariat of Development and Protection of Forests and Natural Environment and consists of the Central Service and the Regional Services. The Central Service, which belongs to the Ministry of Environment, Energy and Climate Change, is the inspecting body of the whole administrational structure of the Forest Service. It is responsible for formulating forest policy, elaborating long-term programmes of forest development, monitoring scientific and technological development in managing forests, working out fire protection programmes, supervising and strengthening research programmes and finally promoting the country’s co-operation with EU, third countries and International Organizations.

The Regional Services, which belong to the Hellenic Ministry of Interior Decentralization and E-government, are the instruments for executing the instructions and forest policy in general formulated by the Central Service, but also for applying local programmes and studies. They are divided into Intraprefectural and Prefectural Services.

Furthermore, two Forest Institutes carry out forest research and two University Forestry Schools and four Technological Educational Institutes of Forestry provide forestry education.

Forest characteristics and forest types - Hungary

Hungary is situated in the middle of Europe, at the central and Western part of the Carpathian Basin. The country's topography and geographical conditions are quite similar with those of its neighboring countries. Hungary is mainly flat. Only 1/3 of the country has an altitude of over 200m above sea level, whereas only 2% has an altitude of 400m above sea level. The highest peak is Kékes-tető (1014m) whereas the lowest altitude is the floodplain of river Tisza (75.8m), in the south of the country.

The most characteristic regions in Hungary are the Northern and Transdanubian Mountains of medium height and the two basins: the Great Plain and the Small Plain. The slopes of the two mountains are mostly covered with forests.

The backbone of the country's water resources are two big rivers, the Danube and the Tisza, whose length in Hungary is 417 and 598 km respectively. Part of the natural watercourses originates from the Alps and Carpathians and flows into the two big rivers in the territory of the country. The largest lakes are Lake Balaton, Lake Velencei and Lake Fertő at the Austrian border.

The majority of Hungary belongs to the European deciduous forest zone and parts of the Great Plain to the forest-steppe zone. However, the preserved original plant cover of Hungary is merely 9 %.

The large lower parts are characterised by small amounts of precipitation and extreme temperature changes. The natural forest areas are found in the Western Transdanubian region and mountains – generally at an altitude of over 400m above sea level. There the annual precipitation generally exceeds 600 mm , which is necessary for the maintenance of forests. In the lower regions, forests can only develop on floodplains or where the water level is not too high but close to tree root. In areas with no water resources only brushlands develop which can hardly be called forests. As forests are needed at such areas for protecting and improving soil and agricultural areas or for providing recreational areas, drought tolerant species are planted (usually trees that are not native to the area). Thus, it is clear that climate conditions – mostly the annual precipitation and the related air humidity – and the presence or absence of supplementary water resources determine the areas where Hungarian forests grow.

Years of human intervention and natural conditions have changed forests and the natural environment significantly. There is no forest in Hungary which is unaffected by human intervention. However, even if forests avoided human intervention, effects of this intervention such as river regulation and air pollution could not be avoided. The proportion of natural-like forests in Hungary is 52% whereas cultivated forests that mainly supply wood account for 48%.

Typical and exceptional fauna and flora species in forests - Hungary

Beech (*Fagus silvatica*) forests are mainly located in mountains of average height, at 600m above sea level and in the lowest but colder and more precipitated Trans-Danubian regions. Today in Hungary, beech forests provide the largest wood volume and are also very important for the environment and nature protection.



Oaks (*Quercus sp*.) are the most typical species in the country. They form mixed forest stands with a number of other species. Hornbeam-oak forests are found on hills of average height with a characteristically closed canopy. Associations of this kind may be seen in more humid parts of the Great Plain. In their typical two-storey stands, hornbeams form the second canopy underneath sessile and pedunculate oaks.



Turkey (*Quercus cerris*) and sessile oak (*Quercus petrea*) forests are the most widespread associations, common in the mountains and hills of 250-400 m above sea level. The shrub and herbaceous layer of turkey and sessile oak forests, is usually very rich due to the light-demanding construction of the canopy of both species which lets light pass through.


Loess-oak forests (*Quercus robur*) – below 200 meters above sea level – are special relict forests under priority conservation of which only a few acres maintain the original marginal lowland vegetation before human intervention.

Beside climate-zonal forests, gallery riparian forests play an important conservation, ecological and economic role.

Hardwood forests, consisting of oak, ash and elm, are found in flooded areas and were developed due to the presence of water. The main species are pedunculate oaks (*Quercus robur*), Hungarian ashes (*Fraxinus angustifolia ssp. pannonica*) and the fluttering elm (*Ulmus laevis*) which unfortunately declines due to the elm tree disease.

Willow and poplar floodplain groves are associations found in the lowest flooded areas of the Plain rivers. They are commonly characterised by rivers, flooded for long periods throughout the year.

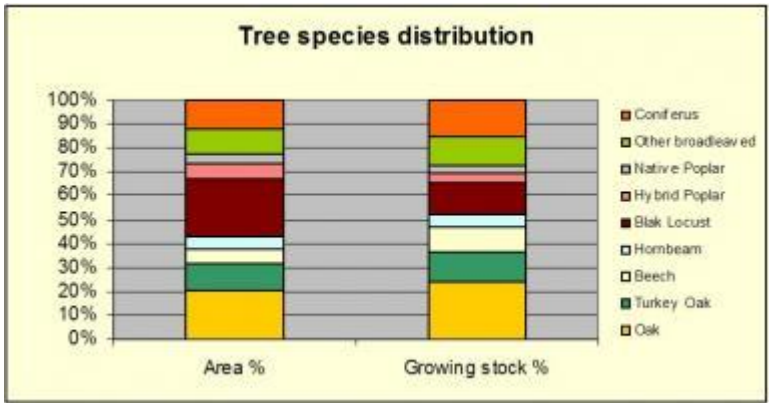
The major species of these associations are white willows (*Salix alba*), black and white poplars (*Populus nigra* and *Populus alba*) and the bush-willows (*Salix sp.*).

Today, on this area due to intensive forest management Euramerican poplars have also been planted.

The widely cultivated forest species is the black locust "acacia" (*Robinia pseudoacacia*) with short rotation periods which make acacia the most common species in the country's forests. This species, native to America, was introduced to Europe hundreds of years ago. Acacias are especially important in poor soil sites, where it is often the only species that can grow. Its wood, apart from other uses, is very useful as firewood even when it is moist. Moreover, acacia's nectar is good for feeding bees.

Climate conditions in Hungary are not the most appropriate for pine forests. Pine forests usually form single species forests. Mixed forests are only formed with Austrian pine (Pinus nigra) and Scots pines (Pinus sylvestris) which are of great importance in Hungary. We can also find spruces and larches (*Picea abies* and *Larix decidua*). Single planted pine species are ecologically unstable, since they are threatened by pest diseases.

The rapid growth of *Euramerican poplars* (*Populus x. euramericana*) – typically planted on plain or floodplain areas –facilitates intensive economic activities. *Euramerican poplars* are established for economic reasons (paper production) and not for protective reasons.



Wildlife
Game stock is a vital part of forest biocenosis.

Large forests are the perfect habitat for red deer (*Cervus elaphus)*, fallow deer (*Dama dama)*, mouflon (*Ovis musimon)*, roe deer (*Capreolus capreolus*) and wild boar (*Sus scrofa).*
Small game species such as hares (*Lepus europeaus*) and pheasants (*Phasianus colchicus*) are also found in Hungarian forests, mainly in smaller plain forests.


All experts agree that big game stock has exceedingly multiplied, and in some cases animals cause serious damages to forests, mainly because of browsing. Game management should be carried out carefully so that game population does not exhaust forest resources, not damage the forest and not prevent forest development. Over the past decades, due to conservation policy, predatory mammals such as wolf, lynx, wild cat and golden jackal (*Canis lupus, Lynx lynx, Felis sylvestris, Canis aureus aureus*) have re-appeared in the highland forests from where they were previously excluded. Hungary boast about the best game trophies in the world such as fallow deer and wild boar. Also, red deer and roe deer antlers are also considered among the best in the world.

Forms of nature protection such as national parks and Natura 2000 sites - Hungary

Nature protection

Protection of forest resources (plant and animal species, geological elements) is ensured by declaring them as protected and strictly protected areas. These areas include: national parks (10), landscape protection areas, protected natural areas, and natural monuments. 9.6 % of the national territory is under legal protection.


Nature conservation is in many cases related to forestry. The percentage of protected forests is more than 50 %.

Forest reserves are a unique nature protection category.

The most significant part of NATURA 2000 area in Hungary includes forests.

The benefits of forests on people's health and life are increasingly appreciated by society. Forest management, according to the Act of Forests, includes recreational activities as forests are overwhelmed by visitors especially in areas close to big cities.

Access to forests is free of charge in Hungary.

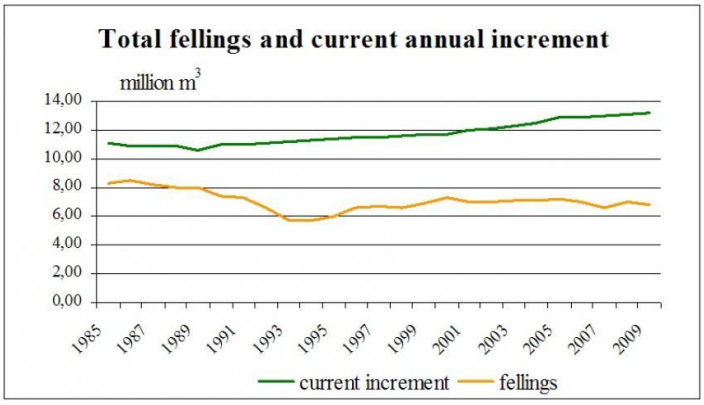
Forest Health

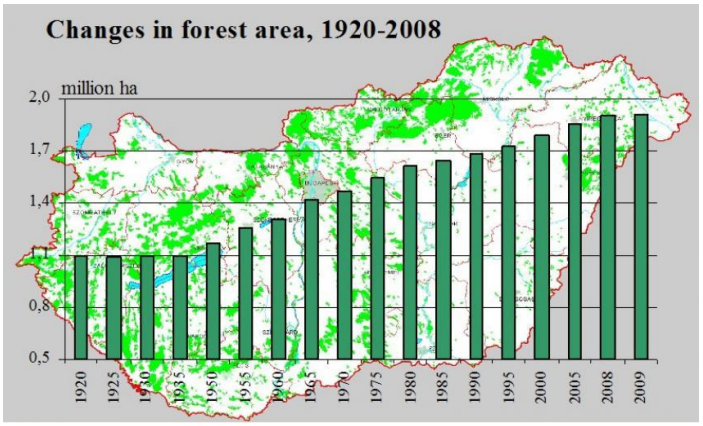
There is a big discussion about the harmful effects of human activity on forests and their deterioration. The crucial threats for moderate climate forests are air pollution, since the 1970's, and climate change, since the 1990's. Although air pollution affected forests in many European regions, this was not the case for Hungary's forests. For many decades Hungary has been using an extensive monitoring system according to European standards. Data collected by monitoring describe the threats and changes in forests, so that protection can be planned in advance.

Organization of Forestry - Hungary

For the past 80 years the forest area of Hungary has been gradually increasing. This is due to large-scale afforestation and tree planting carried out under the supervision of professional foresters. As a result, forest area which in 1921 was hardly larger than 1 million hectares today exceeds 1.9 million ha.

During the past three decades historical changes took place in Hungary (change of the political system, accession to the European Union). Due to these changes forest ownership and forest management have also fundamentally changed.





In Hungary the share of state forests is 57 %, of community forests is 1 % and of private forests is 42 %. A long-term goal is the increase of private and community owned forest areas through afforestation. The highlighted objective of forest policy is the structural improvement of the over-divided estate system that hinders private forest management, and the establishment of viable management organisations and partnerships.

State forests are managed by 22 state forest management corporations**.** However, other national institutions – like water resource directorates, national parks – are also managing state forests.

The share of community forests is relatively small. These forests mostly managed by municipalities of villages and cities.

The majority of private forests are undivided joint properties which are managed by natural persons – having contracts- or corporations.

To ensure sustainable forest management forests are managed only according to district forest management plans issued by the forestry authority for both public and private forests.

Forest characteristics and forest types - Latvia

According to data from the Latvian National forest statistical inventory (NFI) forests and overgrown agricultural land cover 49.9% of the territory of Latvia. The total forest area (land covered by forest, land under forest infrastructure facilities, as well as clearings, marshes and glades) is 54.1% of the country's territory. According to Food and Agriculture Organization of the United Nations (FAO), Latvia is the fourth country in Europe (after Finland, Sweden and Slovenia) with the largest proportion of forests and other wooded lands.

In Latvia, forests are mainly natural systems. Most of them are naturally regenerated forests in which, however, there are indications of human intervention. Forests established by plantlets or seedlings account for 13% of the total forest area. There are not many primary forests (forests of native tree species, untouched by human intervention, where the ecological processes are not significantly disturbed) and they are mainly located in the strictly protected zones of Nature reserves and National parks.

Regarding forest growth, approximately half (49%) of the forests are located on dry mineral soils. However, a comparatively large proportion of forests is also located on drained soils (33%), of which 19% are on drained mineral soils and 14% on drained peat soils. Forests on wet mineral soils cover 10% and forests on wet peat soils cover 8% of the total forest area. These five soil types create 23 forest types with different characteristics. These different forest types are indicative of the site's production ability and determine forest mangement. Within one forest type, different forest stands can be found.

Forests in Latvia are dominated by three tree species – Scots pine, Norway spruce and birch species (silver and downy birch), together they account for 73.8% of the total forest area (according to the data of NFI). The percentage of pine stands is 28.9%, whereas the proportion of spruce and birch stands is 17.0% and 27.9% respectively. The rest 26.2% of forest areas are covered by stands of black alder (5.1%), grey alder (9.8%), aspen (7.7%), ash and oak (1.5%), and other tree species (2%). Coniferous stands in general cover 46% of the total forest area, whereas stands of deciduous trees cover 54%.

According to the Central Europe vegetation classification system forests in Latvia fall into five categories:

- Boreal coniferous forests. A very broad category, which includes forests on dry and wet soils.
- Dry subcontinental pine forests located only on the dry and sun exposed slopes and in the valleys of large rivers.
- Pine and birch bog forests. Forests on wet peat soils or mineral soils, where flora is adapted to bogs.
- Wetland alder woods. The most frequent habitats are: floodplains at rivers and lakes, places of groundwater outflow, bogs and mires where there is tendency to paludification.
- Broadleaved forests. The most common are mixed oak, ash, elm and linden forest stands. These forests are only found to river valleys, lake islands and primary broadleaved areas in Latvia.

Typical and exceptional fauna and flora species in forests - Latvia

Latvia is located in the contact zone of boreal coniferous forests and nemoral summer green deciduous forests, therefore the species typical for these both forest biomes, can be also found in the forests of Latvia.

The typical animals of the Latvian forest fauna are: roe deer, red deer, elk, wild boar, beaver, brown and mountain hare, large predators such as lynx and wolf, and also some small and medium sized predators such as red fox, marten, badger, western polecat and weasel. Most of them are game animals (in total there are 17 game animals in Latvia). Widespread species in the forests of Latvia is also the racoon dog, introduced into Latvia in 1948. Another introduced species is the American mink, which nowadays has displaced the native European mink. Rare special protected species in the forests of Latvia are: brown bear (about 10 individuals), flying squirrel, dormouse (forest, garden, common and fat dormouse), northern birch mouse and several species of flitter-mouse. Otter is also a protected species.

Viviparous lizard, sand lizard, blind worm, common Northern wiper and grass snake are some of the reptiles found in the forests of Latvia. Very rare special protected species are smooth snake and swamp turtle.

There is a great diversity of bird species in the forests of Latvia. Out of 353 wild bird species, found in Latvia, more than one hundred can be found in forests. Rare and protected bird species in the forests of Latvia are: stock dove, black stork, pygmy owl, Tengmalm's owl, middle spotted woodpecker, capercaillie, Ural owl, lesser spotted eagle. Very rare and endangered species are: spotted eagle, red and black kite, eagle-owl, roller and green woodpecker.

More than 200 tree and shrub species are found in the forests of Latvia, of which approximately half are native species, and the rest are alien species. There are also approximately 300 species of lichens, 298 species of mosses and 650 species of vascular plants found in the forests of Latvia.

The main tree species are Scots pine, Norway spruce, silver birch, downy birch, black alder, grey alder, aspen, common ash and pedunculate oak. Other tree species are small-leaved lime, wych elm, fluttering elm, white willow, crack willow, Norway maple, goat willow, common hornbeam – covering 2% of the total forest area. Rare and protected species in Latvia are the common yew, mainly found along the coastline and the common hornbeam, found only in the SSW area.

Regarding the introduced species, the European larch, poplars (*Populus x Canadensis, P. Alba, P. trichocarpa*), Jack pine, Veymouth pine, silver firs (*Abies alba, A. sibirica*), cedar pine (*Pinus sibirica*) and Douglas fir, are the most common, which however cover a small area. The most common underbrush species are juniper, rowan, hazel, alder buckthorn, bird cherry, several species of willows, as well as fly honeysuckle (*Lonicera xylosteum*), guelder rose (*Viburnum opulus*), mountain currant (*Ribes alpinum*), mezereon (*Daphne mezereum*). Rare and protected underbrush species are: whortleberry willow (*Salix myrtilloides*), pallas honeysuckle (*Lonicera pallasii*), spindle (*Euonymus verrucosa*), wild cotoneaster (*Cotoneaster scandinavicus*), black-berried cotoneaster (*Cotoneaster niger*) and dwarf birch (*Betula nana*).

Typical ground vegetation species of boreal coniferous forests are cowberry, bilberry, bog bilberry, crowberry, chickweed Wintergreen (*Trientalis europaea*), heather. Unique pine forests with rare and very rare species are found in the valley of the largest river Daugava, where the snowdrop

windflower (*Anemone sylvestris*), owl-head clover (*Trifolium alpestre*), pyramidal and standing bugle (*Ajuga pyramidalis, Ajuga genevensis*) and vicic (*Lathyrus pisiformis*) are growing. Very rare and special protected plant species in the pine forests are neottianthe (*Neottianthe cucullata*) and cross-leaved heath (*Erica tetralix*).

Typical species of broadleaved forests are dog's mercury (*Mercurialis perennis*), woodruff (*Galium odoratum*), yellow archangel (*Galeobdolon luteum*), ground-elder (*Aegopodium podagraria*) etc. Very rare and special protected species are Lady's-slipper (*Cypripedium calceolus*), rattlesnake Grape-fern (*Botrychium virginianum*), Baltic Ivy (*Hedera helix*).

Forms of nature protection such as national parks and Nature 2000 sites - Latvia

In order to protect and maintain biodiversity, there are in Latvia 706 special protected areas under the law or regulations of the Cabinet of Ministers. These protected areas are classified in eight categories, as follows:

1. *Strict nature reserves*. There are 4 nature reserves under strict protection in Latvia – Moricsala, Grīņi, Krustkalni and Teiči.
2. *National parks*. There are 4 national parks in Latvia: Gauja National Park, Ķemeri National Park, Slītere National Park and Rāzna National Park.
3. *Biosphere reserves*. In 1997 North Vidzeme Biosphere Reserve was established in Latvia. It is included in the international network of biosphere reserves.
4. *Nature parks.* There are 42 nature parks in Latvia. The most popular are Tērvetes Nature Park and "Daugava's Circles" Nature Park.
5. *Protected landscape areas*. There are 9 protected landscape areas in Latvia.
6. *Nature reserves*. There are 260 nature reserves in Latvia.
7. *Nature monuments.* These include protected trees (secular trees, potential secular trees, rare trees of alien species), dendrological plantings, avenues, geological and geomorphological nature monuments (detritions of rocks, secular stones, caves, springs, waterfalls), which have scientific, cultural historical, aesthetic or ecological value. 89 dendrological plantings, 60 avenues and 206 geological and geomorphological nature monuments are protected in Latvia.
8. *7 Protected marine areas.*

In order to ensure protection of endangersd species or special habitats outside or within special protected nature territories where protection is not ensured by any of the functional zones, microreserves have been established in Latvia. In microreserves as in special protected natural territories certain actions that may threaten rare species or their habitats are restricted or prohibited. Microreserves are usually smaller than special protected areas and the establishment procedure is less complicated and shorter compared to that of special protected areas. At the beginning of 2012, 2104 microreserves were established in the forests of Latvia (according to data from the State Forest Services). 1193 microreserves were also established for birds species and 911 microreserves for special protected habitats, plants, insects. Most of the microreserves are found in state forests (93%), whereas 7% are in private forests.

Most of the special protected natural areas and several microreserves belong to the European network of protected areas (Natura 2000), created to ensure the protection of rare and protected species and biotopes. Of all the species and biotopes included in the lists of the two European Union Directives (Birds and Habitats Directives), 20 species of invertebrates, 5 species of mammals, 3 species of reptiles, 11 species of fish, 70 species of birds and 60 types of habitats are found in Latvia and are under protection.

Natura 2000 in Latvia includes 327 territories – 4 strict nature reserves, 4 national parks, 3 nature reserve zones of North Vidzeme Biosphere Reserve, 237 nature reserves, 37 nature parks, 9 protected landscape areas, 9 nature monuments and 24 microreserves. In total they cover 12% of the total area of Latvia. The protection and management status varies – from minor restrictions in landscape areas to total prohibition of any activity in nature reserves.



Organization of forestry - Latvia

In Latvia, approximately half of the forests (50%) are owned by the state, but the state, whereas the rest are owned by private owners and enterprises (48%), and local governments (2%) (According to data from State Forest Service in 2012).

Forests owned by the state are managed by the following Ministries: Ministry of Environmental protection and Regional development, Ministry of Agriculture, Ministry of Education and Science and Ministry of Defence. State forest property managed for protection, such as forests in the

National parks and nature reserves, is under the responsibility of the Ministry of Environmental Protection and Regional development. State forests managed for scientific and research purposes are under the responsibility of the Forest Research Station, an institution of the State Forest Service, supervised by the Ministry of Agriculture. These territories cover 0.8% of the total forest area. State forest property managed for commerical purposes is under the responsibility of the Joint Stock Company "Latvijas Valsts Meži" ("Latvian State Forests" or LVM), in which the main stockholder is the Ministry of Agriculture. LVM is responsible for: forest management, timber sales, production of forest tree seeds, providing forest and ornamental planting stocks, organizing recreation and hunting, and offering mineral resources such as sand, gravel, peat. The institutions of the Ministry of Education and Science, and the institutions of the Ministry of Defence are managing relatively small areas of state owned forests. Among local governments the largest forest owner is Riga City Council, whose forest area is managed by the limited company "Rīgas Meži" (Riga forests).

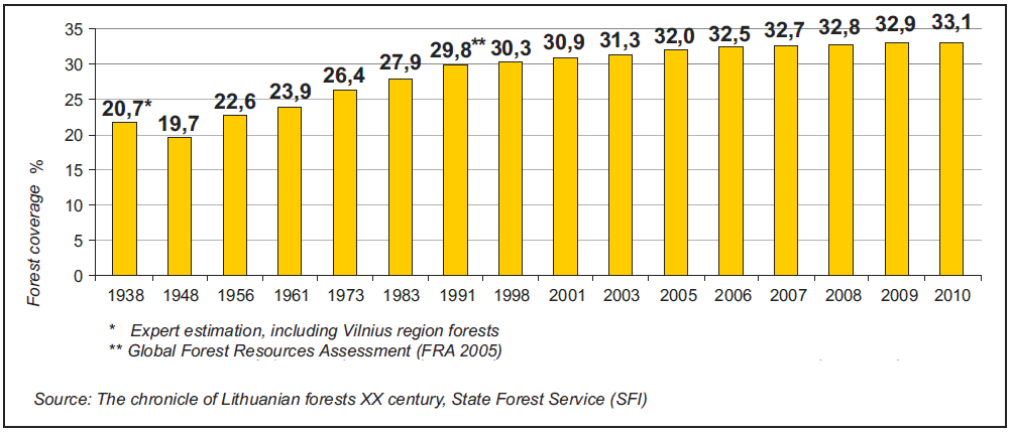
From local governments the largest forest owner is Riga city council.

Sustainable forest development is guaranteed by the Forest Law and subordinate regulations of the Cabinet of Ministers, which define the obligations of forest owners. Forest Law also determines that people have free access in a state or a local government forest, unless normative acts prohibit it. Moreover, free access may be restricted by the legal owner of the forest. State Forest Service is the institution responsible for supervising the implementation of normative acts regarding forest management and forming a unified forest policy in Latvia. State Forest Service is also responsible for implementing long term support programmes which ensure sustainable forest management.

Forest characteristics and forest types - Lithuania

According to 1914 data, forest cover in Lithuania accounted for 19.5%. During World War II (1941-1944) demand for timber highly increased, forests were harvested more intensively, while reforestation rate reduced dramatically. In 1945, coniferous decreased and forest cover accounted for only 16.5%. Forest administration paid attention to forests after World War II. In particular, special attention was paid to forest protection and forest planting during 1944-1990. Due to forest planting (6-8 thousand hectares annually), forest cover started to increase: since 1948 forest cover increased by 13%. In 2003 the Republic of Lithuania approved an afforestation program, aiming at increasing woodland area by 3% within the following 20 years. In 2010 the total forest area accounted for 33.1% of the country's territory and it is still increasing.

Fig. 1. Forest cover in Lithuania, 1938-2010



The average forest area per capita increased from 0,57 ha (in 2003) to 0,65 ha (in 2010) (Table 1). In comparison to other neighboring countries, this number is lower than in Latvia but higher then in Poland.

Table 1. General characteristics of Lithuanian forests **(**Source: State Forest Service (SFI – stand based forest inventory; NFI – national forest inventory); Land Fund of the Republic of Lithuania).

Characteristic	**2010 01 01**
Forest land area according to land assessment, 1000 ha	2126
Forest land area according to Forest assessment, 1000 ha (SFI)	2160
forest area covered by stands, 1000 ha (SFI)	2051
of which planted forest, 1000 ha (SFI)	499
Mean growing stock volume, m^3/ha (NFI)	234
Mean growing stock volume of mature stands of III-IV groups, m^3/ha (NFI)	302
Gross annual increment, m^3/ha (NFI)	7,9
Accumulation, m^3/ha (NFI)	1,6
Forest coverage, % (SFI)	33,1
Forest area per capita, ha (SFI)	0,65
Growing stock volume per capita, m^3 (NFI)	144

Coniferous stands prevail in Lithuania covering 56.3% of the forest area (Fig. 2). Softwood deciduous forests cover 39.6% while hardwood deciduous forests cover 4.1%.

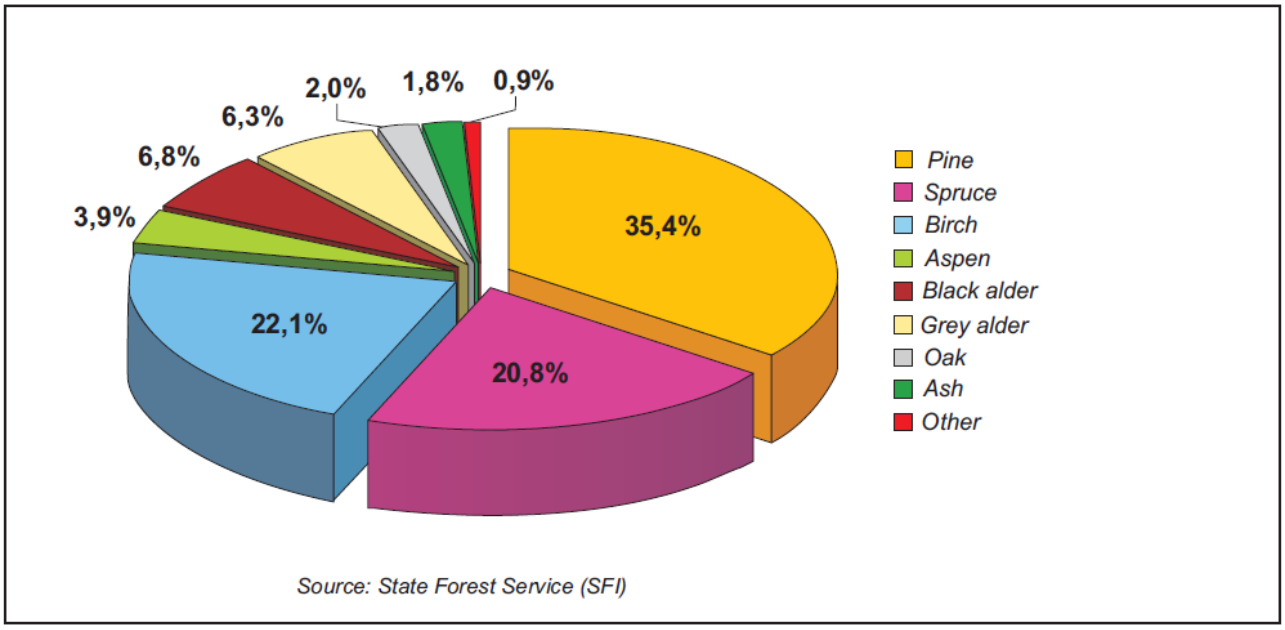


Fig. 2. Forest by dominant tree species 01.01.2010

In the beginning of 2010, forests according to their function were the following:

- group I (strict nature reserves): 1.2%;
- group II (forests for ecosystem protection and recreational purposes): 12.2%;
- group III (forests for protection): 15.5%;
- group IV (commercial forests): 71.1%

Typical and exceptional fauna and flora species in forests - Lithuania

Natural and semi-natural flora occupy one third of Lithuanian territory. There are 1,795 flora species mentioned in Lithuania. Most of them (713 species) grow in forests. More than 4,000 fungus species are found in forests. There are 321 bird species, 213 of them reproduce in Lithuania. White Stork (*Ciconia ciconia*) (Fig.3) was declared the national bird of Lithuania in 1973. Lithuanians believe that storks bring harmony to the families on whose property they nest; they have also kept the tradition of telling their children that storks bring babies. Stork Day is celebrated on March 25. Notably, Lithuania is a favourable and important habitat for these birds: it has the highest known nesting density in the world.


Fig. 3 White Storks

The Lithuanian Red Data Book functions as a legal document on which the protection of rare and endangered plant, fungus and animal species is

based. The Red Data Book contains descriptions of 767 species of animals, plants, lichens and fungi.

Typical tree and bush species in Lithuanian forests are shown in table 2.

Table 2. Main tree and bush species in forest stands

10 main tree species in stands	*The share of tree species per growing stock volume, %*	*10 main bushes species in*	*The share of number of stems, %*
	2010 01 01		**2010 01 01**
Scots pine *(Pinus sylvestris).*	37,30	Alder Buckthorn *(Frangula alnus Mill).*	23,58
Norway spruce *(Picea abies)*	20,15	Bird Cherry *(Padus avium Mill.)*	19,41
Silver Birch *(Betula pendula roth).*	16,65	Rowan *(Sorbus aucuparia L).*	16,81
Black Alder *(Alnus glutinosa (L.)*	8,24	Hazel *(Corylus avellana L.)*	15,19
Aspen *(Populus tremula L.)*	6,24	Gray Willow *(Salix cinerea L.)*	7,14
Grey Alder *(Alnus incana (L.) Moench*	4,30	Common Juniper *(Juniperus communis L.)*	3,10
Pedunculate Oak *(Quercus robur L.)*	2,71	Fly Honeysuckle *(Lonicera xylosteum L.)*	3,69
Ash *(Fraxinus excelsior L).*	1,91	Black Currant *(Rubus nigrum L).*	2,83
Small-leaved Lime *(Tilia cordata) Mill*	0,85	Spindle *(Euonymus verrucosus Scop.)*	2,15
Goat Willow *(Salix caprea L).*	0,44	Snowball Tree *(Viburnum opulus L.)*	1,21

Source: State forest Service (NFI)

There are exceptional trees in forests. Oak stands cover 2 % of forests areas in Lithuania. Oak is treated as a symbol of strength. In the past oak was respectfully protected. The felling of old oaks has been forbidden since 1420. **Stelmuze Oak** is the thickest oak in Lithuania and one of the most aged oaks in whole Europe. Its age is about 1500 years, its diameter is 3.5 m, its perimeter close to ground is 13 m and its height is 23 m (Fig. 4). About 8-9 men are needed to hug the trunk of this Stelmuze Oak.

Fig. 4. Stelmuze Oak

The tallest tree in Lithuania is a larch of 46 m of height, 150 years of age, found in the Degsne botanical reserve (Fig. 5).

Fig. 5. Larch - the tallest tree in Lithuania

Witches Spruce is among the most visited nature monuments (Fig. 6).

Fig. 6. Witches Spruce

In the past Lithuanians believed, that Rowan (*Sorbus aucuparia*) protects against witches and devils, and people used to plant Rowan at at the entrance of their houses.

The natural monument Dubrava Twins, showing the friendship between oak and pine, can be found in Dubrava experimental and training forest (Fig. 7).

Fig. 7. Dubrava Twins – Oak and Pine

The largest animal in Lithuanian forests is European Bison *(Bison bonasus)*. The reintroduction of European Bison started in 1969. Nowadays, there are about 45 European Bisons (Fig. 8).

Fig. 8 Wisent

Among game animals Roe Deer *(Capreolus capreolus)* (Fig. 9) predominate in Lithuanian forests and open air (Table 3). One of the most popular game animals to hunt is wild boar *(Sus scrofa)* (Fig. 10). It is hunted not only for its meat but also for reducing the damage it can cause. Wild boar digs soil and extracts roots resulting in the destruction of crops and pastures.

Fig. 9. Roe deer

Fig. 10. Female Wild boar

Fallow deer *(Dama dama)* (Fig.12) were introduced to Lithuania in the 16-17th century. They were raised in fenced areas. Later on fallow deer disappeared. The present population came from fallow deer which were introduced from ex Czechoslovakia and Soviet Union in 1976-77.

Beaver *(Castor fiber)* (Fig. 11) is an important species supporting their ecosystem.

Fig. 11. Beaver

Fig. 12. Young fallow deer

They create wetlands with increasing biodiversity and provide habitat for many rare species such as water voles *(Arvicola terrestris)*, otters *(Lutra lutra)* and water shrews *(Neomys fodiens)*. Beavers almost became extinct at the beginning of the 20th century, but then they started to adjust again to the environment. Beavers became common on the whole territory of the country causing more and more damage to forests and farmlands. A beaver family can fell as many as 300 trees in a single winter. Beaver population in Lithuania ranges from 100,000 to 150,000.

Table 3. Game animals' population

	Game population assessment 2009-2010 hunting season
Elk *(Alces alces)*	6757
Red deer *(Cervus elaphus)*	21303
Fallow-deer *(Dama dama)*	1089
Roe deer (*Capreolus capreolus*)	117727
Wild board *(Sus scrofa)*	54608
Badger (*Meles meles*)	5160
Wolf *(Canis lupus)*	739

Environmental Protection Department Source: Ministry of Environment

Jay *(Garrulus glandarius)* helps oak regeneration by dispersing the seeds, while Cormorants cause huge damages to forests, especially to the protected ones (Fig. 13).

http://nerija.am.lt/VI/files/Image/DSC_0437kolonija(1).jpg Photo © prof. habil. dr. J. Rimantas Stonys

Fig. 13. Huge areas of valuable old forests in Curorian Spit National Park damaged by Great Cormorant *(Phalacrocorax carbo)*

Some rare bird species nest in Lithuanian forests (Table 4).

Table 4. Nests of rare birds in Lithuania (Environmental Protection Department Source: Ministry of Environment)

	Nests of rare birds, 2010
Black Stork *(Ciconia nigra)*	470
Lesser Spotted Eagle *(Aquila pomarina)*	536
White-tailed Eagle *(Haliaeetus albicilla)*	164
Osprey *(Pandion haliaetus)*	24
Black Kite *(Milvus migrans)*	28
Honey Buzzard *(Pernis apivorus)*	50
Northern Goshawk *(Accipiter gentilis)*	266
Eurasian Hobby *(Falco subbuteo)*	75
Common Kestrel (*Falco tinnunculus*)	5
Common Crane *(Grus grus)*	412

Forms of nature protection such as national parks and Natura 2000 sites - Lithuania

In 2010, the national network of protected areas covered 15.6% of the total Lithuanian territory (Fig. 14, Fig. 15). The national network of protected areas consists of the following areas:

• Protected areas of conservational priority, which include strict reserves (natural and cultural), reserves and objects of natural and cultural heritage.

• Protected areas of ecological protection priority, which include zones of ecological protection.

• Protected areas under restoration, which are designated for restoration, augmentation and protection of natural resources and genetic plots.

• Integrated protected areas, which include **National** and **regional parks** and **biosphere monitoring areas** (biosphere reserves and biosphere polygons).

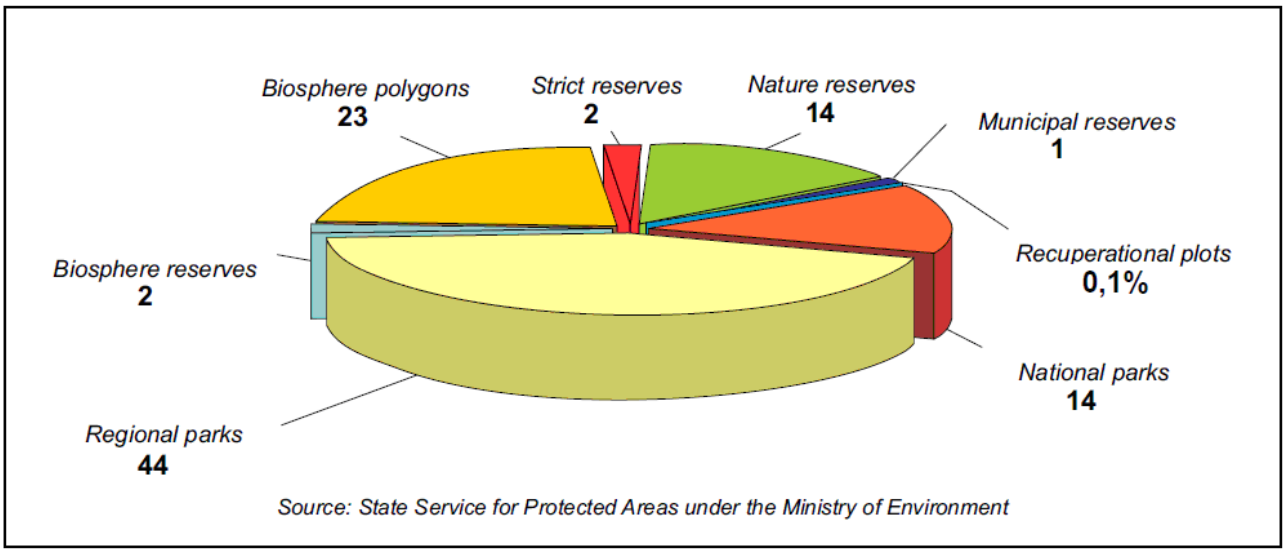


Fig. 14. Percentages of Protected Areas by categories 01.01.2010

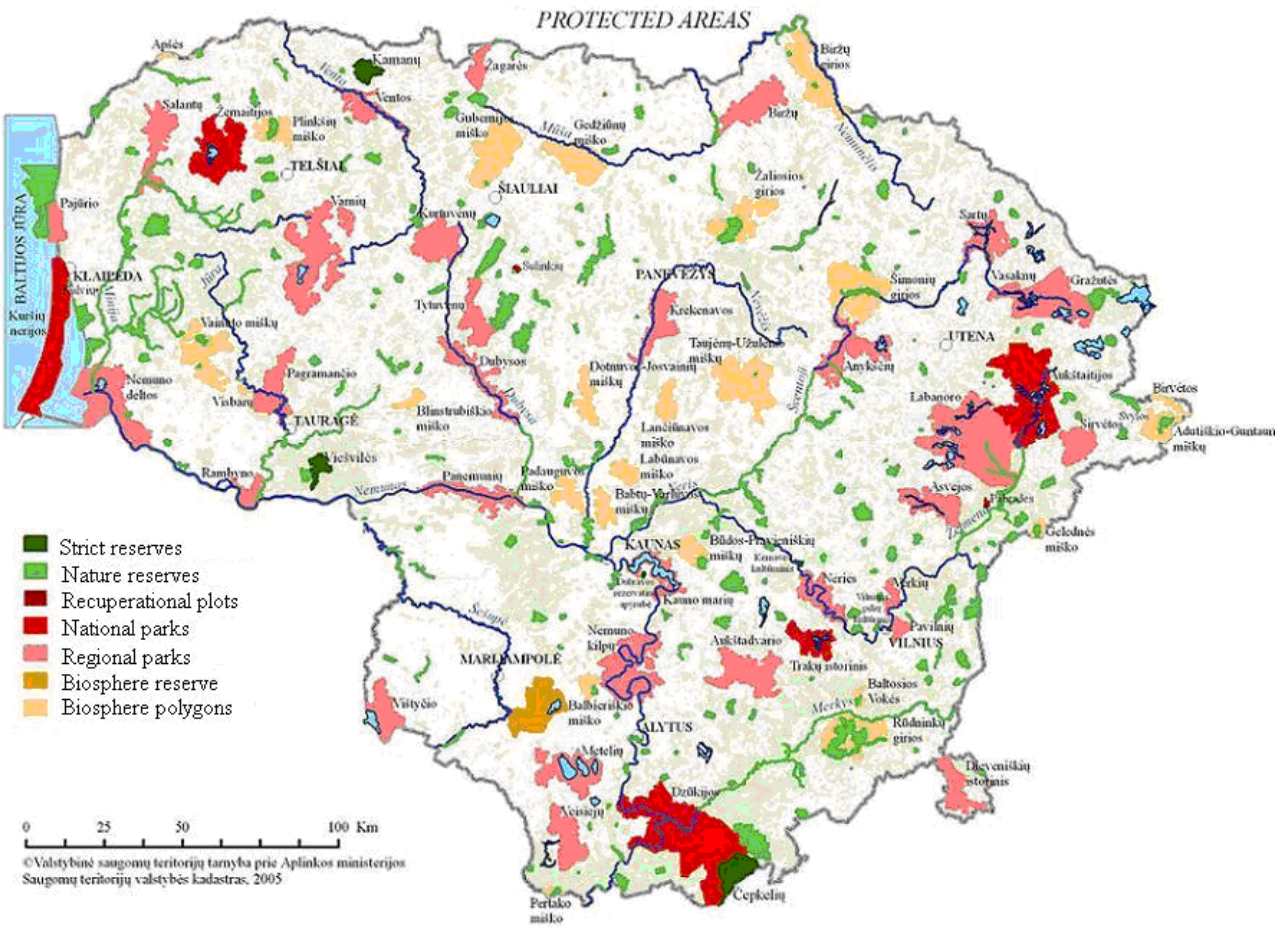


Fig. 15. Distribution of Protected Areas in Lithuania

At the beginning of 2010, the Natura 2000 network covered 12.4% of the country's territory (Table 5, Fig. 16).

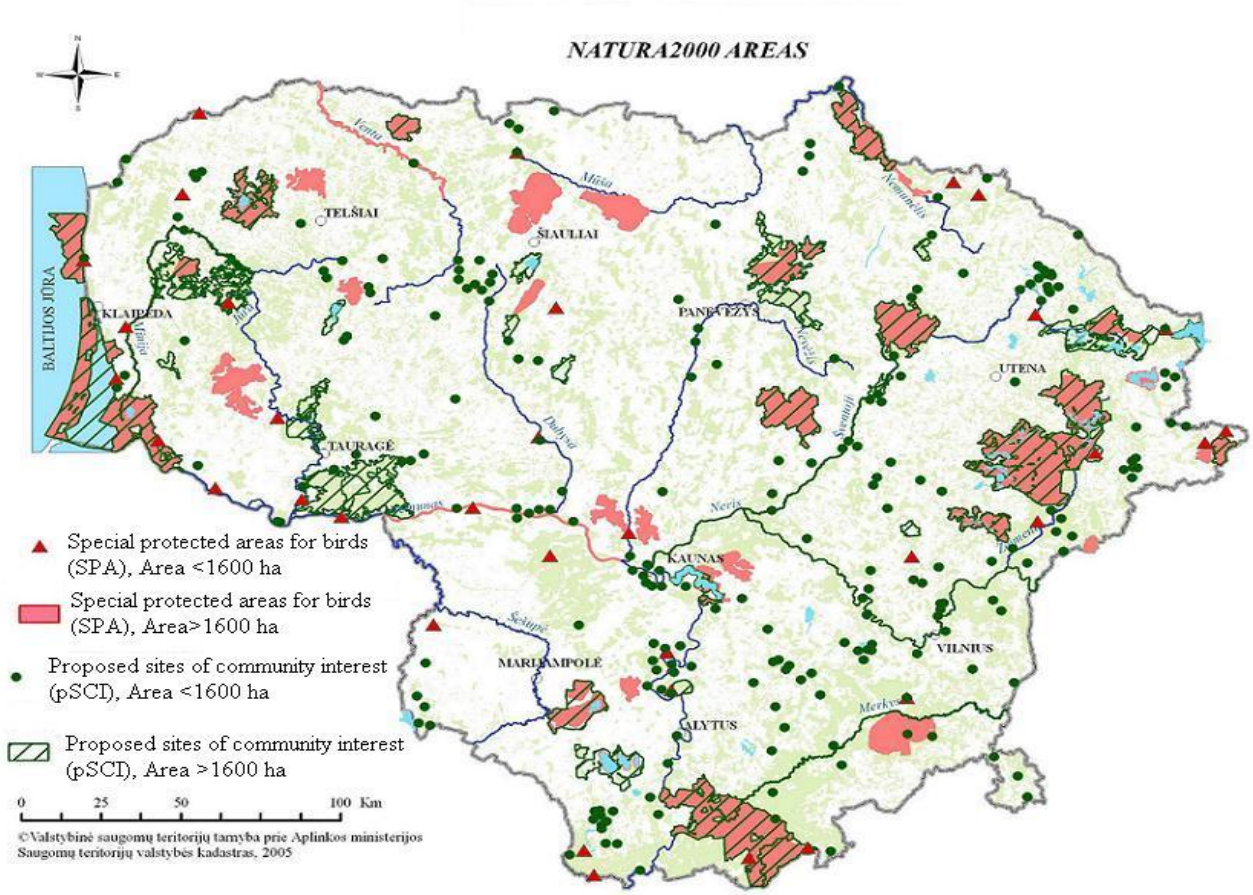
Table 5. Natura 2000 areas in Lithuania 01.01.2010

Category	Number	Area 1000 ha		Overlapping area 1000 ha	% from territory of country
		Total	Marine areas		
Special Protected Areas (SPA)	77	516,7	29,6	373,2	7,9
Proposed Sites of Community Interest (pSCI)	406	651,6	15,0		10,0
Total *	**483**	**810,1**	**29,6**		**12,4**

* *Area and percentage excluding overlapping SPA and pSCI areas*

Source: State Service of Protected Areas under the Ministry of Environment

Fig. 16. Distribution of Natura 2000 areas in Lithuania



Bog woodland and Western taiga predominate among sites of community interest in Lithuania (Table 6).

Table 6. Forest habitat types and areas protected under Directive 92/43/EEB (on current pSCI list),

Code	Forest habitat type	Area
2180	Wooded dunes	515 ha
9010	Western taiga	7543 ha
9020	Old broad-leaved deciduous and mixed forests	2097 ha
9050	Fenn. herb-rich forests with *Picea abies*	1178 ha
9060	Coniferous forests on, or connected to, eskers	-
9070	Fenn. wooded pastures (together with 6530 Fenn. Wooded meadows)	93 ha
9080	Fenn. deciduous swamp woods	3619 ha
9160	Oak or oak-hornbeam forests of the *Carpinus betula*	4252 ha
9180	*Tilio-Acerion* forests of slopes, screes and ravines	760 ha
9190	Oak woods with *Quercus robur* on sandy plains	187 ha
91D0	Bog woodland	17010 ha
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*	1573 ha
91F0	Riparian mixed forests along the great rivers	105 ha
91T0	Central European lichen Scots pine forests	500 ha
Total:		39 430 ha

Source: http://www.gmu.lt/overview_of_the_natura_2000_network/

Organization of Forestry - Lithuania

In 2010, around half of the total forest area in Lithuania was of State importance (Fig 17).

Source: Forest cadastre of the Republic of Lithuania

© Valstybinė miškų tarnyba

Fig. 17. Forest ownership map in Lithuania

42 State forest enterprises and 1 national park, under subordination of the Ministry of Environment, managed 1,028,000 ha of forest land (Fig. 18). The average size of forest districts is 3 000 ha.

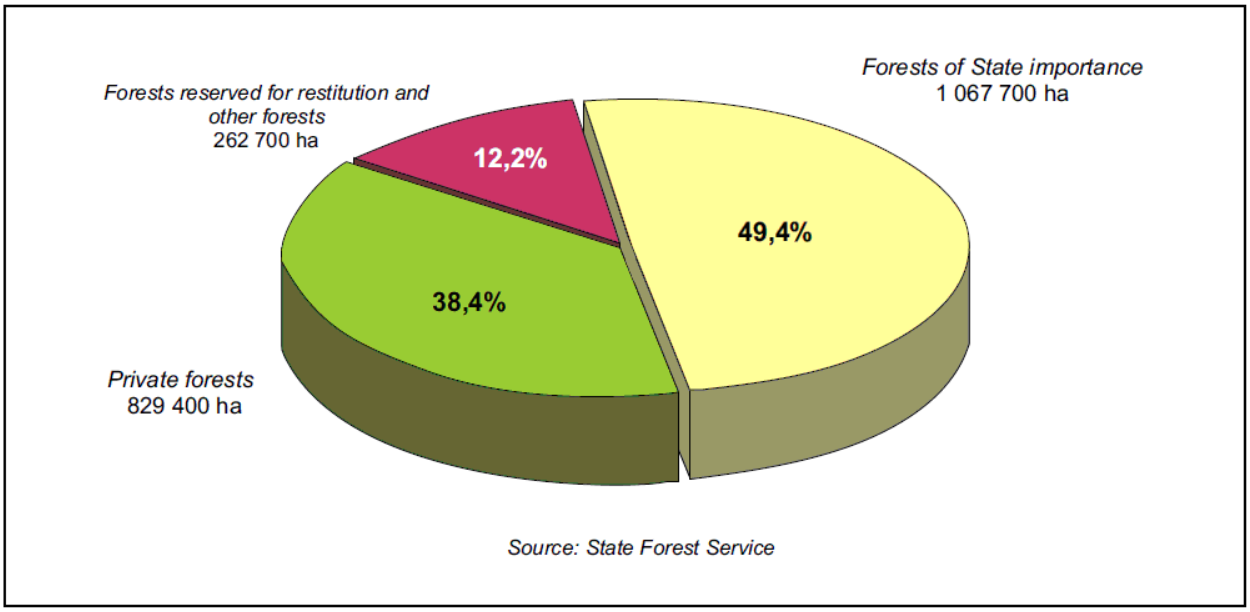


Fig. 18. Forest land by ownership 01.01.2010

The implementation of forest policy and strategy is under the responsibility of the Forest Department at the Ministry of Environment.

Reforestation, protection and use of forest resources of state forests attributed to forest enterprises are organized and coordinated by the General Directorate of State Forests under the Ministry of Environment.

General Directorate of State Forests is an institution, responsible for the economic management of state forests, attributed to 42 state forest enterprises. The General Directorate of State Forests establishes the mandatory norms for forest enterprises regarding reforestation, protection and management of forests; it also organizes and co-ordinates the implementation of advanced technologies in reforestation, protection, and use of forests and forest resources.

The uniform system of state fire prevention measures, comprising monitoring, preventive and fire control measures, is established and kept in forests irrespective of the forest ownership status. This uniform state system of fire prevention measures is implemented and organized by the General Directorate of State Forests and the state forest authorities and directorates of national parks along with town (regional) municipalities.

In 2010, the number of private forest owners amounted to almost 242 000 and a forest property/plot was in average 3.3 ha.

Forest characteristics and forest types - Norway

It is very difficult to give in SHORT the characteristics of Norwegian forests since Norway is a LONG country. Its length, almost meridional, exceeds 2 thousands kilometres and that affects the country's natural conditions. The timberline in the area around Bergen reaches at 600m above sea level, while in the far north is around the sea level. The growing season varies in a similar way. The temperature is above 6^{o}C in Oslo for 176 days, in Trondheim for 115 days and in Kirkenes for 90 days. Near Bergen where the Gulf Stream sweeps along the coast, the growing season is the longest (194 days). More than 50% of the country is mountainous and thus not appropriate for woody plants. Despite the above conditions, forest cover in Norway accounts for 20% of the total area (37% of which is forest and the rest is woodland), in the Eastern part of the country this percentage is 35%, in the West 9% and in the North is only 7%. This great diversity is due to climatic and topographic differences and to some extent due to demand for agricultural land. Productive forests cover an area of 7.2 millions of hectares. Among the conifers, Norway spruce and Scots pine are the dominant species (introduced Sitka spruce is of increased importance), whereas, among the broadleaved species, birch and aspen are the dominant species. Only Norway spruce and Scots pine, besides Sitka spruce on West coast, are economically important. Birch is valuable as fuelwood and is also used in the pulp and paper industry.

The main forest areas are found in the South inland while in the North inland the landscape is dominated by low quality birch (*B. odorata tortuosa*). However, in some sites pine forests can also be found.


In general, in Norway, there are four ecoregions as defined by WWF:

1. Scandinavian coastal coniferous forests
2. Scandinavian montane birch forest and grasslands
3. Sarmatic mixed forests
4. Scandinavian and Russian taiga

Each of them has typical flora and fauna.

Typical and exceptional fauna and flora species in forests - Norway

Due to the large latitudinal range of the country and its varied topography and climate, Norway has more different types of habitats than almost any other European country.

There are approximately 60,000 species of different life forms in Norway and in the adjacent waters (excluding bacteria and virus). There are 2,800 species of vascular plants, 450 bird species (250 species nesting in Norway), and 90 mammal species. About 40,000 of these species have been described by scientists. The Red List of 2006 includes 3,886 species. 17 species are mainly listed because they are endangered on a global scale, such as the European Beaver, even if the population in Norway is not considered as endangered. There are 430 fungus species on the Red List, many of these are found in small remaining areas of old-growth forests. There are also 90 birds species on the list and 25 mammals species. 285 species are listed as critically endangered (CR) in Norway, some of which are: gray wolf, arctic fox (healthy population on Svalbard) and pool frog.

The largest land predator is polar bear, the largest predator on the Norwegian mainland is brown bear, whereas the largest herbivore is common moose. In Norway some of the most exceptional species in Europe still exist: muskox, wild reindeer, white-tailed sea eagle and killer whales.

Natural vegetation in Norway varies considerably, as it is expected in a country with a large latitudinal range. There are generally fewer tree species in Norway than in areas in western North America with a similar climate. That is because the migration routes after the ice age were more difficult in the north - south direction in Europe. Many introduced plants have been able to ripen seeds and spread, whereas less than half of the 2,630 plant species in Norway today are considered native. About 210 plant species growing in Norway are listed as endangered, and 13 species are endemic. National parks in Norway are mostly located in mountain areas, and only about 1.7 % of the productive forests in the country are protected.

Some plants are classified as western due to their need for high humidity and low tolerance to winter frost. These are found close to the south-western coast, with the northern border near Ålesund; some examples are holly and bell heather. The mild temperatures along the coast allow for some surprises; some hardy species of palm grow even as far north as Sunnmøre, one of the largest remaining Linden forest in Europe grows at Flostranda in Stryn and planted deciduous trees such as horse chestnut and beech thrive north of the Arctic circle (as in Steigen).

Plants classified as eastern need comparatively more summer light, less humidity, and they tolerate cold winters; these are often found in the southeast and inland areas. Some examples are: *Daphne mezereum, Fragaria viridis* and spiked speedwell. Some eastern species common in Siberia grow in the river valleys of eastern Finnmark. There are also species which seem to be in-between these extremes, such as the southern plants, for which both winter and summer climate is important (pedunculate oak, European ash and dog's mercury). Other plants depend on the type of bedrock.

There is a considerable number of alpine species in the mountains in Norway. These species do not tolerate long and warm summers and cannot compete with plants which have adapted to a longer and warmer growing season. Many alpine plants are common in the North Boreal zone and some in the Middle Boreal zone, but their main area of distribution is on the alpine tundra in the Scandinavian mountains and on the Arctic tundra. Many of the hardiest species have adapted by using more than one summer to ripen seeds. Examples of alpine species are glacier buttercup, *Draba lactea* and *Salix herbacea*. Some alpine species have a wider distribution and also grow in Siberia, such as the *Rhododendron lapponicum* (Lapland rosebay). Other alpine species are common in the whole Arctic whereas some grow only in Europe, such as globe-flower.

Forms of nature protection such as national parks and Natura 2000 sites - Norway

The list of national parks of Norway includes 33 national parks on the Norwegian mainland

and 7 on Svalbard archipelago.

In addition to national parks, the Norwegian government has designated larger areas for protection:

• 153 landscapes parks

• 1,701 nature reserves

• 102 natural monuments,

• 98 smaller protected areas.

This accounts for 12.1 % of Norway's mainland. The Norwegian government intends to increase this area in the future to at least 15 %.

The idea of establishing national parks is fairly old. This issue was raised from the early 20s of the previous century. However, the first NP (Rondane) was established only 50 years ago. Let’s have a look at some of Norway’s National Parks.


Rondane National Park is the oldest national park in Norway, established in 1962. In the park there are 10 peaks of more than 2000 metres altitude. The highest peak is Rondslottet at an altitude of 2,178 m. The park is an important habitat for herds of wild reindeer. The park was extended in 2003.

Jotunheimen ("Home of the Giants") ***National Park*** is a national park in Norway, recognized as one of the country's first hiking and fishing regions. The national park is part of the broader area of Jotunheimen. More than 250 peaks are above 1,900 metres, including Northern Europe's two highest peaks: Galdhøpiggen 2,469 metres and Glittertind at 2,465 metres. The National Park covers most of the mountain area of Jotunheimen. Glaciers have carved the hard gabbro rock massifs of the Jotunheimen, leaving numerous valleys and many peaks. Wildlife includes reindeer, elk, deer, wolverines and lynx. In most lakes and rivers trout can be found.

Hardangervidda National Park is Norway's largest national park. Designated as a national park in 1981, today it serves as a popular tourist destination for activities such as hiking, climbing, fishing, and cross-country skiing. A railway line and a Highway cross the plateau. Several hundreds nomadic Stone Age settlements have been found in the area. There lies the southernmost boundary of several arctic animals and plants. Wild reindeer herds found there are among the largest in the world.

Jostedalsbreen National Park is a national park in Norway that encompasses the largest glacier on the European mainland, Jostedalsbreen. The park was established in 1991 and it was extended to the northwest in 1998. Within the Park there is the Famous Ice Museum (Bremuseum).

Forlandet National Park lies on the Norwegian archipelago of Svalbard. The park was established in 1973 and covers the entire island of Prins Karls Forland as well as the sea around it. This marine area is famous as the world's northern border of Stone Seals and of the population of Common Guillemot. In this area there are numerous archaeological remains from Norwegian and Russian hunters and whalers. At Svalbard (Spitsbergen), the Forlandet NP and six others NPs cover more than 60% of the island's area.

Organization of Forestry - Norway

Forests and other woodlands cover approximately 37%, of the Norwegian mainland almost 23% of this is regarded as productive forest. The productive forest is divided into 125,000 forest properties. About 79% of the productive forest belongs to private owners. In Norwegian forestry, unlike

forestry in other European countries, forests can at the same time be used as agricultural land. In that case, the average size of the forest property is about 36ha.

There is also big private forest property too. The state has a small share of the total public forest, about 12%, not on poor sites. That 12% of the total area produces less than 7% of the annual cut. The Ministry of Agriculture is mainly responsible for the forest sector. Other Ministries and Institutions actively involved in forest management are the Ministry of the Environment, county and municipal forest authorities and the State Forest Service.

The Forest and Forest Protection Act (1965, with later amendments) is the main legal framework for forest management. Other laws regulating the forest sector are the Nature Conservation Act.

In Norway, organizations of forest owners have a crucial role. One of the biggest and oldest is the Norwegian Forest Owners' Federation. The history of the organization covers almost one century (it started in 1913). It is a cooperative association consisting of 8 district co-operatives and 368 local societies with 44.000 co-owners throughout Norway. The co-operative is an economic organization involved in promoting round wood and other forest products and in providing training opportunities for its members. The organization is also a considerable shareholder in Norwegian forest industries aiming at ensuring markets for its products. The organisation also publishes a monthly magazine titled "Skogeieren" (The Forest Owner).

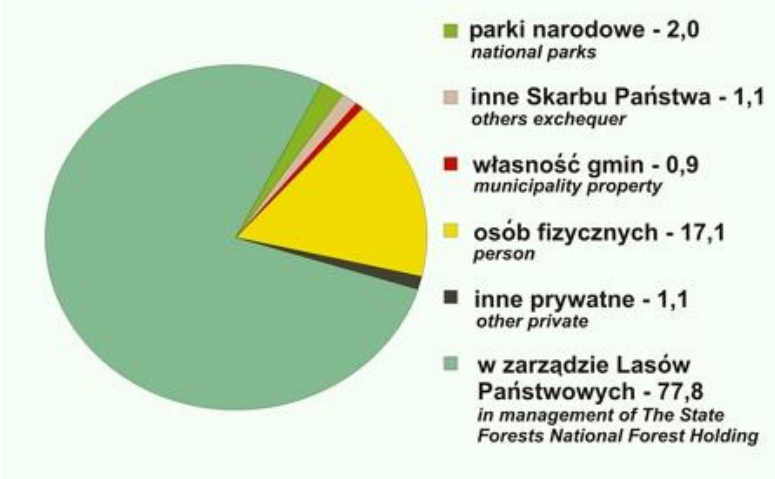
Norwegian forests have been exploited intensively for export of roundwood, sawn timber and wood tar for hundreds of years. In addition, there is a long tradition of using forests for grazing domestic animal and hunting game.

Grazing (cows, sheep, goats) in Norwegian forests is common. The majority of private forests are fenced in order to prevent livestock from escaping. Fencing does not prevent access to the forest. Access to the forests is for free (driving, horse riding need special permission). Another Nordic habit is moose (elk) hunting. In Norway 40,000 – 50,000 of moose are hunted every year. Moreover, there is always the wild reindeer, a game species also typical in the region. In Northern part of Norway, in tundra rather than in forests, herding of domesticated reindeer is also very popular.

Forest characteristics and forest types - Poland

Nowadays forest area in Poland covers (according to 2009 data from Central Statistic Office) 29.1% of the country's territory. Just after Second World War that percentage was 20.8%. There is a constant increase of the forest area. Regarding forests ownership, public forests are dominant (81.8%), of which state forests account for 77.8%.

Ownership status is presented below.



Ownership status of forests in Poland (GUS)

On the left side Typical pine forest in Stare Masiewo surroundings. Coniferous forests cover 52.6% of the forested area in Poland.
On the right side: Oak-hornbeam forest in Bialowieza National Park. Broadleaved forests cover 47.4% of the forested area in Poland.

Forest areas are dominated by coniferous forests, covering 52.6 % of forested area, whereas broadleaved forests cover 47.4 %. Pine dominates in lowlands and in significantly richer soil sites, whereas spruce dominates in highlands and mountains. This domination of coniferous species even on very rich habitats, often as monoculture stands, is the result of clearcutting forest management, which was very popular in the past. Clearcutting involves removing mature stands in one cut (often in big areas) and establishing new stands artificially (by planting and rarely by sewing). Stands

reestablishment has been followed in Poland for the past 20 years. The same practice was applied in other middle-European countries.

The most interesting flora communities are: oak-hornbeam forests, riparian forests and alder forests.

Oak-hornbeam forests are broadleaved forests on fertile loam soil. They are often adjacent to riparian or alder forests from one side, and mixed pine forests from the other. In the tree level we can mostly find: oak, hornbeam, small-leaved lime. Hornbeam is an important forest component, nursing the upper level. In that type of forest the following species can also be found: hazel, alder, buckthorn, dogberry, and juveniles of linden, hard beam, maple, oaks. During summer forests are dark, and ground vegetation grows in early spring, before leaves appear on trees.

Riparian forests are typical of river and stream valleys. Shallow groundwater is the characteristic element of these forests. In these forests we can find: black alder, ash, singly- maple, hard beam, bird cherry and spruce.

Alder forests - In the tree level we can find alder as well as downy birch, spruce, English oak, ash, and sometimes other species. For alder forests periodic flows caused by the raise of shallow groundwater are common. In these forests, the areas that are not flooded are very important, since they allow tree growth and regeneration.



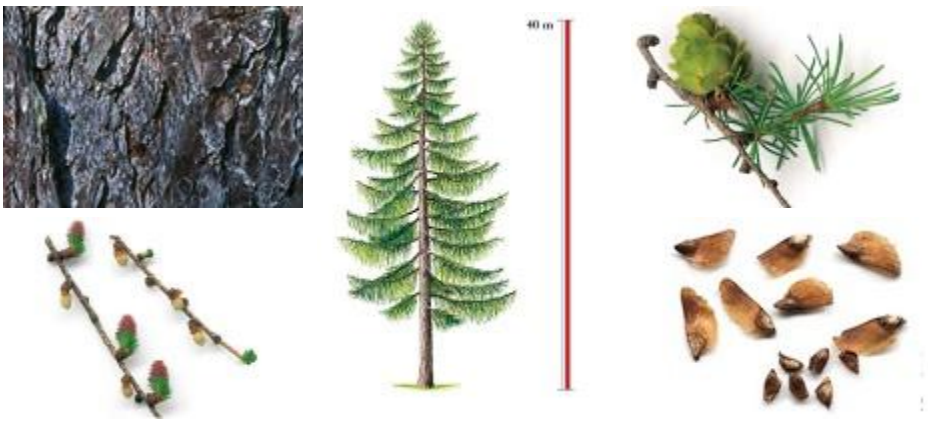
Oak-hornbeam forests, riparian forests and alder forests are most interesting in respect of flora

Typical and exceptional fauna and flora species in forests - Poland

Because of its moderate climate (in-between oceanic and continental) Poland is famous for the most diverse and the richest forest biocenose in Central Europe. There are 2,300 vascular plants, 600 mosses, 250 *Hepaticopsida*, and 1600 lichens. Among vascular plants we can find species from various geographical regions such as: Eurasia, North-Americn, Arctic, Middle-Europe, West-Europe, Black-Sea; even Mediterranean Sea.

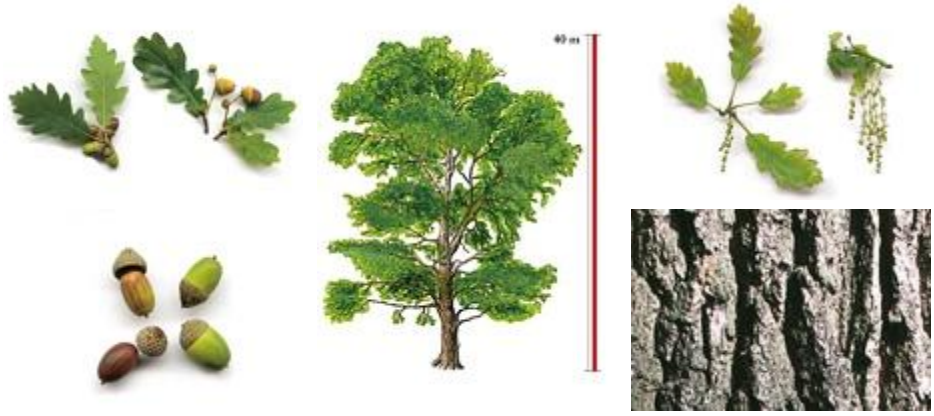
Pine trees (*Pinus sylvestris*) and sporadically larch cover 70% of the forest area.

Pinus sylvestris *(Photo & Visuals © Oficyna Wydawnicza FOREST)*



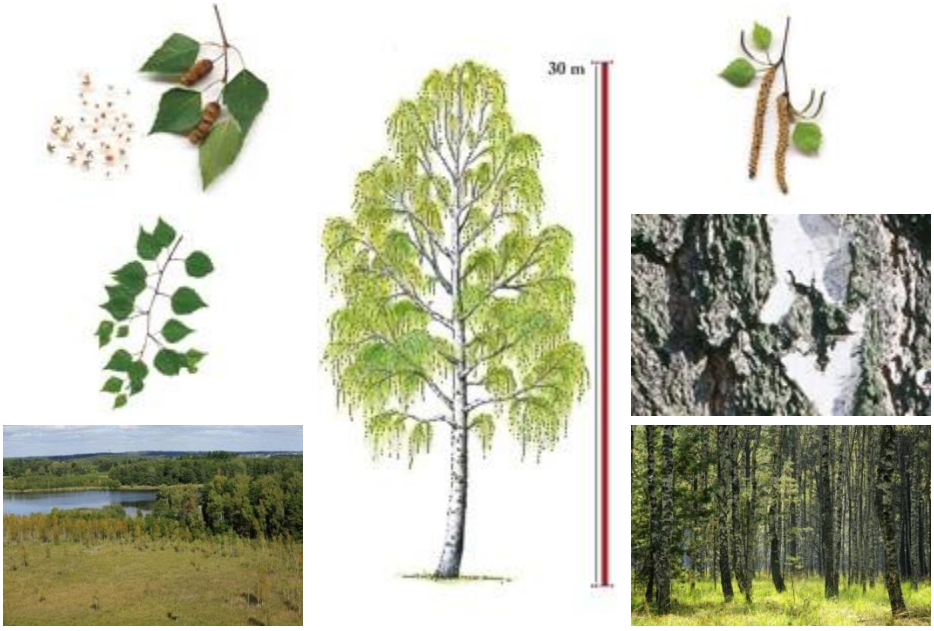
Larix europaea (Photo & Visuals © Oficyna Wydawnicza FOREST)

Among broadleaved species, oak (*Quercus sp.*) dominates - 7.3 %. Mostly we can find pedunculate oak (*Quercus robur)*, and rarely sessile oak *(Quercus petraea*), which grows on less fertile soils.



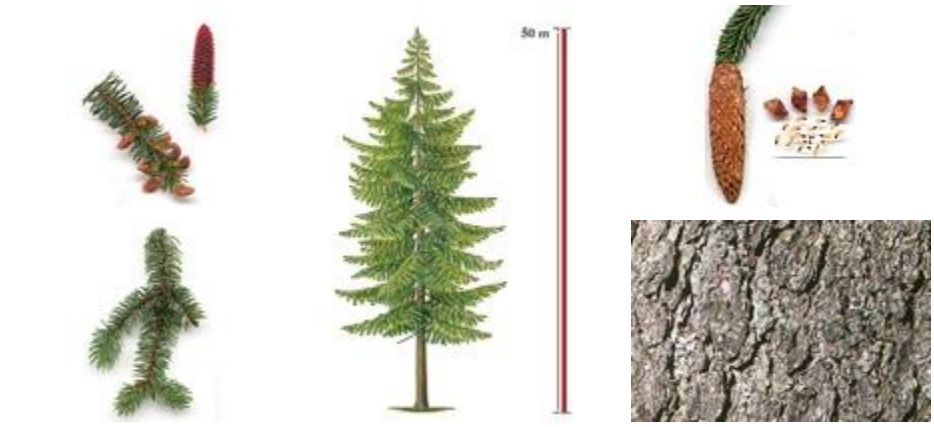
Quercus sp. (Photo & Visuals © Oficyna Wydawnicza FOREST)

Birch (*Betula sp.*), covers almost 7% of forests. Birch, as a pioneer species, is the species usually regenerated first on waste grounds.



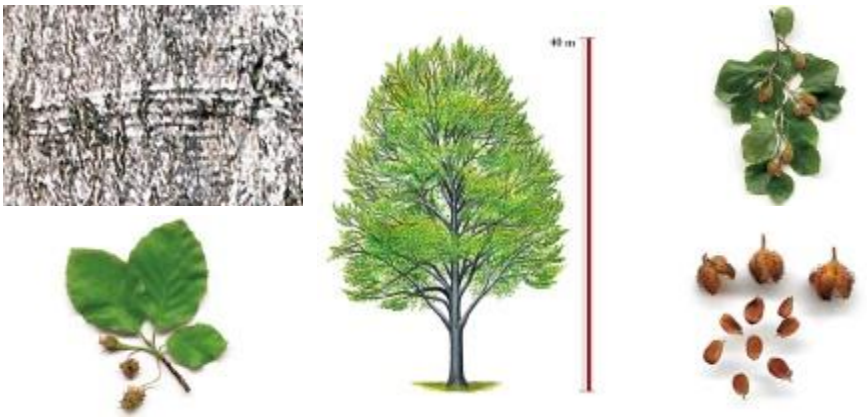
Betula sp. (Photo & Visuals © Oficyna Wydawnicza FOREST)

Spruce (*Picea abies*) covers 5.5 %, and is mainly found in north-east Poland and in highlands and mountains.



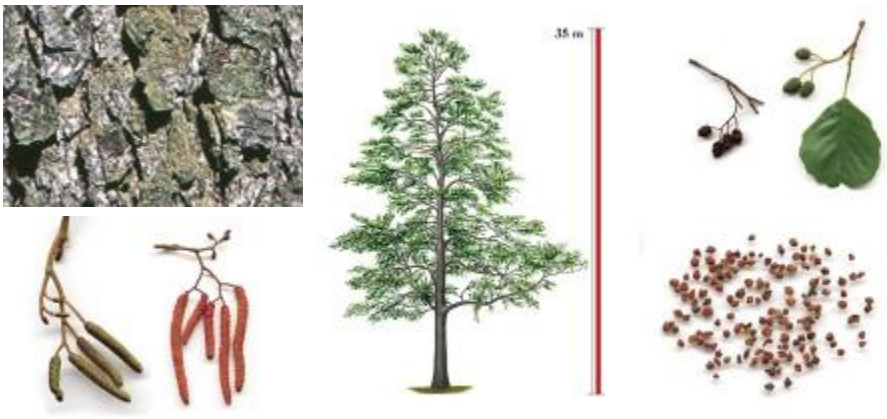
Picea abies (Photo & Visuals © Oficyna Wydawnicza FOREST)

European beech (*Fagus sylvatica*) - covers 5% of forests. Beech is found in the south and west of Poland.



Fagus sylvatica (Photo & Visuals © Oficyna Wydawnicza FOREST)

Alder (*Alnus sp*.) covers 4.4% of the forest and is mostly found in wet habitats - alder and riparian forests.



Alnus sp. (Photo & Visuals © Oficyna Wydawnicza FOREST)

Silver fir (*Abies alba*) is a significant species (2 %). Its share in highlands and mountain forests is constantly increasing.

Abies alba (Photo & Visuals © Oficyna Wydawnicza FOREST)

Abies alba (Photo & Visuals © Oficyna Wydawnicza FOREST)

Other broadleaved species, e.g. maple, sycamore maple, aspen, poplars, hornbeam, mountain ash, in total cover less than 1 % of area.

Among the endemic species in Poland the following can be mentioned: *Larix polonica,Delphinium oxysepalum, Dendranthema zawadskii.*

Betula nana *Delphinium oxysepalum* *Dendranthema zawadskii*

Among relict species (disappearing species or from other periods) the following can be mentioned: *Dianthus sylvestris, Salix lapponum, Betula nana, Dryas octopetala, Saxifraga wahlenbergii*.

Salix lapponum

Saxifraga wahlenbergii

Fauna in Poland is characterized by species which came to Poland during various periods, especially after the last glacier. In Poland about 33,000 of fauna species can be found (including invertebrates). Among terrestrial vertebrates there are 85 mammal species, 220 bird species nesting in Poland, 8 reptile species, 17 amphibians and 55 fishes. Most of them can spread easily and fast and can be found in the whole European moderate zone. Such species are: *Tinca tinca*, carp (*Cyprinus carpio*), toad (*Bufo bufo*), blindworm (*Anguis fragilis*), grassnake (*Natrix sp.*), chaffinch (*Fringilla coelebs*), green-headed mallard (*Anas platyrhynchos*), goshawk (*Accipitersp.*), squirrel (*Sciurus vulgaris*), hare (*Lepus europaeus*), roe-deer (*Capreolus capreolus*), deer (*Cervus elaphus*). They are typical of broadleaved and mixed forest areas.

The number of endemic species is estimated at 36 and relict species at 38. Chamois (*Rupicapra rupicapra*) and alpine marmot (*Marmota marmota*) are examples of relict species.

Rupicapra rupicapra

Marmota marmota

Description of some fauna species:

Exceptional species: Bison (*Bison bosanus*). Nowadays in Poland there are more than 1000 individuals. Adult males weigh about 440-920 kg, females are smaller, 320-640 kg whereas young bisons weigh 16-35kg. The duration of pregnancy is about 260 days and young bisons are born during spring. Bisons eat mostly plants from forest ground, and spend 80% of their life for grazing.

Typical species: **Deer** (*Cervus elaphus*). In Poland there are more than 178 thousand individuals. Adult males weigh about 220 kg. Antlers are shed every winter and grow again in spring; at the age of 10 deer have got the biggest antlers.

Exceptional species: **Wolf** (*Canis lupus*). In Poland there are about 600-700 individuals. These populations are found in the north-east, middle-east and carpathian part of the country.

Bison and wolf – exceptional species of fauna in Polish forests

Forms of nature protection such as national parks and Natura 2000 sites - Poland

Nature Protection in Poland includes:

• Flora and fauna species protection

• Nature monuments protection

• Establishment of nature reserves

• Establishment of National parks

• Establishment of Landscape parks

• Designation of protected landscape areas

• Designation of Natura 2000 sites

The most known Polish national parks are:

Bialowieża National Parki

It is the oldest national park in Poland. Its emblem is the bison. It includes very valuable natural lowland forests. 500 years ago hunting and settlement were prohibited with a king's decree which,

although it was issued for other purposes, was beneficial for nature and society. Animals were set free to nature from zoos and animal gardens during interwar times.


Strictly protected area in Bialowieza National Park and polish primitive horse

Tatra National Park

Tatra is the only mountain range with alpine characteristics. Its emblem is the chamois. It is connected with the Slovak Tatra National Park. In both parks brown bear and alpine marmot can be found.


Forests in Tatra National Park and touristic path in mountains

Góry Stolowe National Park

It represents the only example in Poland and a very rare in Europe where mountains are in horizontal rock layers. There we can also see a stone city, a mushroom-shaped rock and other formations, as a result of erosion.

Characteristic mountains with rock layers and the flat tip – "table mountains"

Biebrza National Park

It is the biggest one. It includes the valuable Biebrza wetlands (the biggest European wetlands) which are almost untouched. Biebrza River is the last one of this size in Europe maintaining its natural character.

Wetlands of Biebrza valley with a big moose population

Kampinoski National Park

This park is found next to the capital of Poland, Warsaw. Every year it is visited by one million tourists, who can hike on 360 km trails. The park is famous for the sand dunes, close to swamps, and for moose, beaver and lynx reintroduction.

Sand dunes next to swamps near Warsaw (Kampinoski NP)

There are 23 National Parks in Poland. They cover a total of 300 thousand ha, that is 1% of the country. 60 % of the Parks are forests. 7 parks have been declared as world biosphere reserves. Bialowieza NP is the only on the UNESCO list. By the end of 2008 in State Forests there were over 1,200 reserves. In the forests there are also almost 11 thousand nature monuments (trees or trees groups, alleys, rocks, caves).

Poland participates in the Natura 2000 European network. By the end of 2008, 29% of state forest areas were designated as Special Areas of Conservation (SAC), whereas 15.1 % of forests were designated as Special Protection Areas (SPA).

Organization of Forestry - Poland

In Poland dominate public forests (81,8%). Laws for forest management are based on the 1991 “Ustawa o lasach - Forests act”. This Act applies to all forests regardless of ownership status. State Forests are supervised by the Ministry of Environment whereas non-state forests are supervised by the mayor of the county.

Forests under the administration of the State Forests National Forest Holding (PGL LP) constitute 77,8% of all forests. In particular, forest management is implemented by the PGL LP general director in cooperation with the State Forests General Board and the 17 Regional Directorates. For the forest management there are forest districts supervised by forest inspectors who take decisions according to the forest management plan. In Poland there are 428 forest districts.

On forest trails

Mushrooms

When there is high fire risk, there is no entrance to the forest

In Poland access to forests is permitted. However, there are restrictions for special areas such as forest nursery, research areas, animal territories and river springs. Access restrictions can be periodic (e.g. in case of fire or stands destruction).

Forest characteristics and forest types - Portugal

Portugal is located in the extreme southwest of the European continent. In North and East Portugal borders with Spain, the only country with which Portugal borders and forms the Iberian Peninsula, and in West and South it borders with the Atlantic Ocean. Despite its small size, Portugal has significant climatic differences due to three factors: latitude, different influences (oceanic in the West, continental in the East) and relief (North more rugged and elevated and the South predominantly peneplain) [1].

For its size, Portugal is one of the European countries with the greatest diversity of organisms and agricultural/forestry systems [2].



The diversity of Portuguese forests is big. There are oak forests, pine forests, eucalyptus forests, cork oak forests, sweet chestnuts stands and Laurissilva. Some of the forests are very special – for their history, the amazing landscapes, unique trees, biodiversity or for their educational and scientific value [3].

The specificity of Portuguese forests is characterized by a strong human intervention during the past centuries [2].

According to the last National Forest Inventory, the forest area on Portugal (continent and archipelagos) accounts for 39% [4] of the territory, thus, Portugal is the 12th largest forested area in the European Union [5].

The main tree species are: Maritime pine (*Pinus pinaster*) (28%), Eucalyptus (*Eucalyptus globulus*) (23%), Cork oak (*Quercus suber*) (23%), Holm oak (*Quercus rotundifolia*) (13%), Oak (*Quercus* spp) (5%), Stone pine (*Pinus pinea*) (4%), Sweet chestnut (*Castanea sativa*) (1%), other hardwoods (3%) and other softwoods (1%) [4].

Maritime Pine forests

Maritime Pine (*Pinus pinaster*) forests expanded in the early XIX century. This was mainly due to private forest owners initiative although Public Forest Services have also contributed to the afforestation of coastal dunes and common land. The use of this species was to prevent the advance of the dunes and to protect soil from erosion, due to the fact that it is a pioneer species and tolerant to almost all types of soils. Currently, the area covered by maritime pine forests

is decreasing and the immediate causes are forest fires and pests. The main function of these stands is the production of wood for industrial uses. Maritime pine forests, mainly of anthropogenic origin, have historical and social value and are an important factor in economic development of rural areas either with commercial purposes, either through a series of complementary activities such as apiculture, pastoralism, game, mushroom production or resin tapping [6].

Eucalyptus forests

Eucalyptus globulus forests are intensively managed for commercial purposes. The plantations of this fast-growing species are used for paper pulp industry, an industry of great national importance. These forests have a controversial history in Portugal and since the beginning there were objections to its cultivation of an environmental point of view [7].

Although eucalyptus forests in Portugal are widely used in paper products, essential in today's society, there are relatively few people who associate this species and its forest production to paper used in daily basis [8]. The current legislation is very strict on the expansion of eucalyptus and prevents the establishment of large contiguous areas [2].

Cork oak forests

Cork oak (*Quercus suber*) forests, called '*Montados de Sobro'*, are agro forestry semi-artificial systems created by man and have multiple uses. These stands are very important ecosystems in terms of biodiversity and multifunctionality. They are typical of the South landscapes and form the largest area of contiguous native trees in Portugal, representing about 34% of the world area. They host a rich fauna and flora constituting biodiversity hotspots. Considered national heritage, the cork oak forests are legally protected. It is prohibited to cut trees without authorization from the Forest Public Services and its plantation and exploitation is encouraged [11]. In 2011, *Quercus suber* was considered national tree.

Holm-oak forests

Holm Oak (*Quercus rotundifolia*) forests, called '*Montados de Azinho*', are open structures with agro-forestry-pastoral use, created and maintained by man, which provide a wide variety of products such as acorn, firewood, charcoal and forage material, honey, mushrooms and game. The main product, acorn, is a very important food resource for domestic species such as 'Alentejan pig' and game species such as partridges (*Alectoris* spp), wild boar (*Sus scrofa*) and deer (*Cervus elaphus*) [12].

Oaks forests

In Portugal there are also other oak forests such as Portuguese oak forests, European oak forests and Pyrenean oak forests.

Forests of native **Portuguese Oak** (*Quercus faginea*), known by 'Cercais', have amazing landscape and are extremely rich in biodiversity [13].

Forests of native **European oak** (*Quercus robur*) are mainly found in the North where there is the highest percentage of natural distribution with high ecological, economic and social value [14].

Forests of native **Pyrenean oak** (*Quercus pyrenaica*) provide a multiple use of the forest, soil and water conservation, biodiversity, natural landscape and improvement of the climate, and are an important source of wood and non-wood resources [15].

Stone Pine forests

Stone pine (*Pinus pinea*) forests are natural or artificial stands. They have been traditionally used for wood, resin, and, in particular, seed (pinion) production. They are very common along the Southern coast [16] where we can find the highest percentage of contiguous stands (62% of the total area). In this area 50% of the total pinecone is produced [17]. The vegetation under forest cover, very rich in endemic and rare species, is an important source of biodiversity. For the above reasons coastal stone pine forest is considered a priority habitat by the European Community and is included in the Natura 2000 Network [16].

Sweet Chestnut forests

Sweet chestnut (*Castanea sativa*) forests used for timber production are called 'Castinçais', while forests used for chestnut (fruit) production are called 'Soutos'. There are more "Soutos" than "Castinçais'. Chestnut forests provide high quality wood (for carpentry, joinery and furniture) and also a large quantity of chestnut (either for human consumption or for animal breeding) contributing to the increased diversity in the composition and structure of forest stands [18]. Chestnut is the main dry fruit produced in Portugal and holds the 3rd place in chestnut production in Europe with an average production of 30.000 tons [19].

Riparian forests

Riparian formations protect water streams and ensure water quality.

Alluvial: formations where deciduous species grow such as Poplar (*Populus* spp.), Willow (*Salix* spp.), Ash (*Fraxinus* spp.), Elm (*Ulmus* spp.) and Alder

(*Alnus glutinosa*).

Riparian: formations where the species described above grow as well as species such as Ibero-African shrubby spurge (*Securinega tinctoria*), Tamarisk (*Tamarix* spp.) and, more rarely, the Pyrenean oak (*Quercus pyrenaica*) or Hazel (*Corylus avellana*).

Laurissilva forests

Classified as UNESCO World Heritage Sites, these forests are intermediate formations between durissilvas (short leaf and rigid) and pluvissilvas (rainforests of hot climates). Since humid temperate conditions are rare on Earth today, Laurissilva forests are relict formations found in few habitats, always on the edge of the temperate regions, with major oceanic influences. These forest types are found in the archipelagos of Madeira, where they cover nearly 60% of the land and in Azores [20].

Typical and exceptional fauna and flora species in forests - Portugal

Below we can see some indicative examples of fauna and flora species of the Portuguese territory, including Azores and Madeira archipelagos, and in Iberian Peninsula.

Fauna

Class	Species	Classification
Migratory and freshwater fishes	Portuguese pardelha (*Chondrostoma lusitanicum*)	Endemic species in Portugal
	Torgal chub (*Squalius torgalensis*)	
Amphibians	Gold-striped salamander (*Chioglossa lusitanica*)	Endemic species in Portugal
	Iberian painted frog (*Discoglossus galganoi*)	
Reptiles	Iberian rock lizard (*Lacerta monticola*)	Endemic species in Portugal
	Bedriaga's skink (*Chalcides bedriagai*)	
Birds	Trocaz Pigeon (*Columba trocaz*)	Endemic species in Madeira
	Plain swift (*Apus unicolor*)	
	Azores'Bullfinch (*Pyrrhula murina*)	Endemic species in Azores
	Goldcrest (*Regulus regulus sanctae-mariae*)	
Mammals	Iberian lynx (*Lynx pardinus*)	Endemic species in Iberian Peninsula
	Cabrera's vole (*Microtus cabrerae*)	

Flora

Indigenous tree species:	Native shrub species:
Portuguese oak (*Quercus faginea)*	Strawberry-tree (*Arbutus unedo*)
Monchique oak (*Quercus canariensis*)	Portuguese crowberry (*Corema album*)
Cork oak (*Quercus suber*)	Prickly juniper (*Juniperus oxycedrus*)
Holm oak (*Quercus rotundifolia*)	Bay laurel (*Laurus nobilis*)
Common holly (*Ilex aquifolium)*	Mock privet (*Phillyrea latifolia*erno)
Scots pine (*Pinus sylvestris)*	Portugal laurel (*Prunus lusitanica* ssp. *lusitanica*)
Wild service-tree (*Sorbus torminallis*)	Common yew (*Taxus baccata)*

Forms of nature protection such as national parks and Natura 2000 sites - Portugal

The geographical position of Portugal, which covers the biogeographical regions - Atlantic and Mediterranean in Portugal and Macaronesian in the archipelagos of Madeira and Azores - explains Portugal's high biological diversity.

In Portugal the Fundamental Network for Nature Conservation includes, among others, the National Network of Protected Areas and Natura 2000 Network [1]. In December 2010 the total area under the National Network of Protected Areas and Natura 2000 Network accounted for about 22% of the Portuguese continental territory [21].

Natura 2000 sites

In Portugal within Natura 2000 network there are 96 Sites of Community Interest (SCI) and 59 Special Protection Areas (SPA). In Azores were ranked 2 SCI, 23 Special Areas of Conservation

(SAC) and 15 SPA, while in Madeira were classified 9 SCI and 4 SPA [22]. In comparison with the other countries of the European Union, Portugal is above the average (about 15%). Only countries like Spain, Bulgaria and Slovenia have a greater percentage [21].

National Network of Protected Areas

These areas account for about 7.8% of Portugal territory, plus a marine surface [21]. There are currently the following types:

1 National Park: the only one is "Peneda-Gerês" National Park created in 1971.

13 Natural Parks: the oldest is "Serra da Estrela" Natural Park, the highest mountain of continental Portugal with an altitude of 1993 meters.

9 Natural Reserves: the oldest is "Sapal de Castro Marim – Vila Real de Santo António" Natural Reserve.

10 Protected Landscapes: the oldest is "Serra do Açor" Protected Landscape.

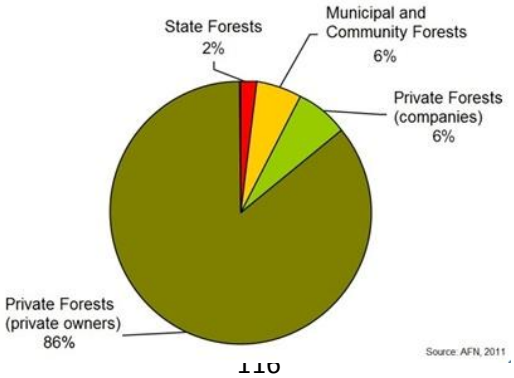
7 Natural Monuments: the oldest is "Pegadas de Dinossáurios de Ourém/Torres Novas" Natural Monument, located in 'Serra de Aires e Candeeiros' Natural Park.

In **Azores** there are 31 Protected Areas – 9 Natural Parks (one per island) and 1 Marine Park [1].

In **Madeira**, in 1982, the Madeira Natural Park was created covering about 2/3 of the island. Within it Laurissilva is classified as a Biogenetic Reserve by the European Council and as a World Natural Heritage by UNESCO [1].

Organization of Forestry - Portugal

Portugal is one of the European countries with the highest percentage of private forests – 92% - while only 2% are owned or managed by the State, and 6% are community forests (common land) [23].



Regarding the structure of private property there are significant differences between the North and the South of Portugal. The Northern and Central regions are dominated by small and fragmented properties while the Southern region is characterized by large properties, mostly covered by Cork-oak and Holm-Oak forests (the 'montados').

Due to this ownership structure and to the rural exodus with the abandonment of the rural areas, private owners associations are a solution to a better technical support and to create a dimension that allows better management and protection of forests.

The Forest Owners Organizations (FOO) represent forest owners and managers and provide a wide range of services such as counseling, support to forest owners and producers, and forest management. Another important service is the support given for the creation and management of forest intervention zones (ZIF). These areas of at least 750ha aim at promoting group management based on the active participation of the land owners. In addition, the FOO ensures the implementation of public programs in order to promote and protect resources and forest areas, against forest fires and biotic agents. There are currently 169 OPF registered 83% of which are located in the North and Central regions of continental Portugal.

Public forests are managed by the Nature and Forest Conservation Institute (ICNF), a body responsible for the protection and management of national forests, supervised by the Ministry of Agriculture, Sea, Environment and Regional Planning (MAMAOT).

Forest sector

Forests and the forest sector in Portugal is of great importance. The forest sector is the third economic sector in Portugal, providing wealth and welfare for all society. It is one of the pillars of the country's economic development, representing 5% of national Gross Value-Added (GVA), 3% of national Gross Domestic Product (GDP), 14% of industrial GDP and 5% of national employment [9].

This sector also has the advantage of being sustained largely by national natural resources representing the sub-sectors activities principally specialized in the export of intermediate and final products, whose value is on average 10% of national exports [26].

The three main **Portuguese Forest Sub-sectors** which differ in terms of species, forest ownership and management, forest industries and market structures, are:

Sub-sector of Pine

Maritime pine (*Pinus pinaster*) forest is the backbone of the sawmill industry and conglomerates. Its main objective is the production of wood for industrial purposes. One of the by-products is bark which is used as organic matter to nurseries or fuel. Their logs have many industrial uses, such as unwinding or sheet, furniture and interior decoration, carpentry and joinery, sawing, grinding and

firewood [6]. This sub-sector is divided into four areas: wood sawmills, wood panelling, joinery and wood furniture.

Sub-sector of Eucalyptus

Currently, Portugal is the 6th European producer of paper pulp and the 13th in the production of paper and paperboard. The paper is the main product line in exports. Paper and pulp represent more than half of the total exports [5]. Other industries such as civil construction and furniture use eucalyptus wood.

Sub-sector of Cork oak

Portugal is the country with the largest area of cork oak (*Quercus suber*) in the world (34%), followed by Spain, Morocco, France and Italy. It is therefore, the world leader in cork production and processing accounting for 53% of world production. Almost the entire production (90%) is exported [9]. Cork industry is extremely important for the Portuguese economy. Cork stoppers are the main products exported, followed by construction materials. Portuguese products are mainly exported to France, USA and Spain [11].

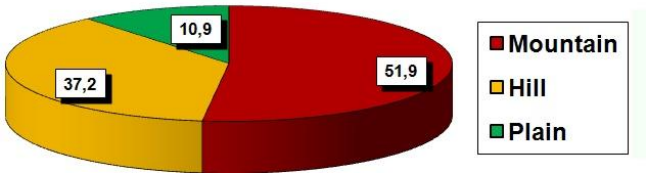
Portuguese forests value

The economic value of Portuguese forests (wood, cork, fruits and seeds, pastures, resin, honey, mushrooms and herbs, hunting, fishing, coastline, protection of water regime, desertification, biodiversity, carbon storage, biomass for energy), taking also into account losses (related to forest fires, pests and diseases), is estimated at 994 million Euros [27].

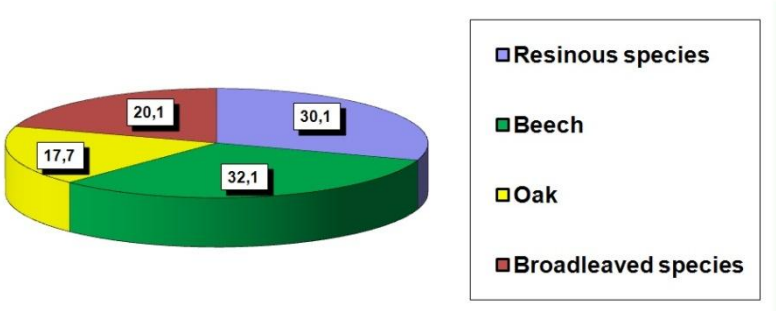
Forest characteristics and forest types - Romania

Romania is covered by rich and diverse vegetation, where forests account for about 27% of the national territory. From the top of the mountains to the seashore one can find shrub and rocky vegetation, impressive coniferous forests, mixed spruce, primary fir and beech forests, meadows and ancient forests in hills and plain regions, oak or mixed broadleaved forests on plains, fringing forests along flooded meadows, halophytic or costal plants alongside the large rivers or the seashore, wetland vegetation or boundless reed beds within swamps and the Danube Delta vegetation. This rich diversity is due to the country's geographical location, wherein four different climates coexist: continental, south European, sub-Mediterranean and central European. Therefore, in Romania 5 different geographic bioregions can be found (alpine, continental, pontic, panonian, stepic).

The distribution of forests on various relief types is illustrated in the next diagram, 37.2 % of forests are in the mountain areas (Carpathian Mountains), 51.9 % of forests are located in the hill areas and 10.9 % of the forests are situated in the plain areas.



In Romania's forests, the most sensitive ecosystem types are the steppe forests where forests are exposed to dry climates and to climate changing effects. The distribution of tree species in forests, illustrated below is: 32.1% of forests are beech forests, 30.1% consist of resinous trees species, 17.7% of oak tree species and 20.1% of broadleaved tree species.



Forest structure indicates the orientation of the Romanian forestry in applying seed-based regeneration of older stands or planting new seedlings after clear cuttings. The purpose of that is to obtain diversified and uneven aged stands with high ecological stability and valuable industrial timber.

During the last century forest is affected by natural and human factors. The main factors are long dry periods (climate change), industrial pollution (transboundary in some cases), intensive grazing

and forest logging using improper technologies. The most affected species are oak and fir. Due to climate change, some forest vegetation zones are taking the place of others in some mountain ecosystems. For example beech forests are advancing in altitude replacing former fir forests.

The classification of forests in different age categories is also an interesting factor. In Romania an important category includes forests older than 100 years. In this category pristine forests are also included. A comprehensive study carried out by the Romanian Forest Research Institute did identify more than 200,000 hectares of pristine forests.

Romanian pristine forest

Typical and exceptional fauna and flora species in forests - Romania

Romanian forests have a rich diversity in terms of woody and herbaceous species providing a considerable stability of forest ecosystem and environment protection.

Out of the 50 vegetation formations identified at national level, 34 are forest formations including species of zonal areas such as: Swiss pine, Norway spruce, fir, beech, durmast, oak, Turkish oak and *Quercus frainetto* – as well as some species of intrazonal areas such as larch, *Pinus nigra,* ash elm, native poplars and willows.

Beech and Norway spruce, the most common tree species in Romania

Among the natural forests of Romanian Carpathians some relict species which survived from the glacial ages are worth mentioning: *Syringa josikaea, Hepatica transsilvanica,Betula nana, Betula humilis, Salix stareana and Vaccinium oxycoccus.*

Some endemic species have also been identified such as: *Dianthus tenuifolius, Dianthus spiculifolius, Ranunculus carpaticus, Silene dubia,* etc, and the well-known *Dianthuscallizonus* (Symbol of the Piatra Craiului Massif).

Dianthus callizonus

In forest we can find the typical animals of Romania. 36 mammal species out of the 43 and 156 birds species out of the 250 can be found in forests. Exceptional fauna species in Romanian forests are: bear *(Ursus arctos)*, about 50 % of the European population, wolf (*Canis lupus*) about 40 % of the European population, red deer (*Cervus elaphus*), chamois (*Rupicapra rupicapra*), wild boar (*Sus scrofa*), roe deer (*Capreolus capreolus*), lynx (*Lynx lynx*), hare (*Lepus europaeus*), wild cat (*Felis sylvestris*) and pheasant (*Phasianus colchicus*).

Wolf and bear, ones of the most important fauna species in Romanian forests

Forms of nature protection such as national parks and Natura 2000 sites - Romania

Old-growth and semi-virgin forests are of great importance for the conservation of the forest biodiversity, as they host many flora and fauna species typical of the temperate zone, as well as an important number of relict and rare species.

In Romania, the national network of protected areas consists of 29 special protected areas (National Parks, Nature Parks and Biosphere Reserve Danube Delta) and more than 900 smaller nature protected areas.

The most important National and Nature Parks in Romania:

Maramures Mountains Nature Park

It is the largest nature park of Romania, which includes a zone of contiguous habitats in the north of the country. Restricted access due to the border line and steep relief helped typical flora and fauna species of the Carpathians to survive. The area is considered as a protected area created by nature.

Steam train (Mocanita), houses, wooden churches and gates come to complete a landscape stilluntouched in the middle of the Carpathians.

Piatra Craiului National Park

Piatra Craiului with the longest limestone ridge of Romania, hosts the largest number of valleys and residual shapes such as: walls, belts, notches and hollows. *Dianthus calizonus* is an endemic species of the area, also referred as the emblem of the mountain.

Some of the big carnivores typical of this park are: brown bear, wolf and lynx. Chamois is also found at the upper belt of the mountain.

Vanatori Neamt Nature Park

Lying on the north-eastern side of the Romanian Carpathians, in the historic province of Modavia, the Vanatori Neamt Nature Park is the only one in Romania which developed a European programme for the bison reintroduction. That's why, the Park is well known as the "Bison Land". It is known as a Sacred Natural Site, because of the presence of 16 famous Romanian Orthodox monasteries and hermitages. The living monastic communities (about 1.100 monks and nuns) represent the second largest Christian monastic community in Europe.

Agapia Veche Convent

European Bison

Retezat National Park

This park is the oldest Romanian National Park, established in 1935. The Retezat famous treasures are found in the alpine zone, where there are more than 80 lakes. As for unique landscapes, the glacial cirques and valleys are breathtaking for the visitors. Bucura lake is the widest glacial lake in Romania, Zanoaga lake is the deepest glacial lake. There are also impressive primary beech and Norway spruce forests. Retezat Mountain is considered to host between 31 % and 47 % of the Romanian flora.

"Slavei" glacial Lake *Chamois on Retezat's screes*

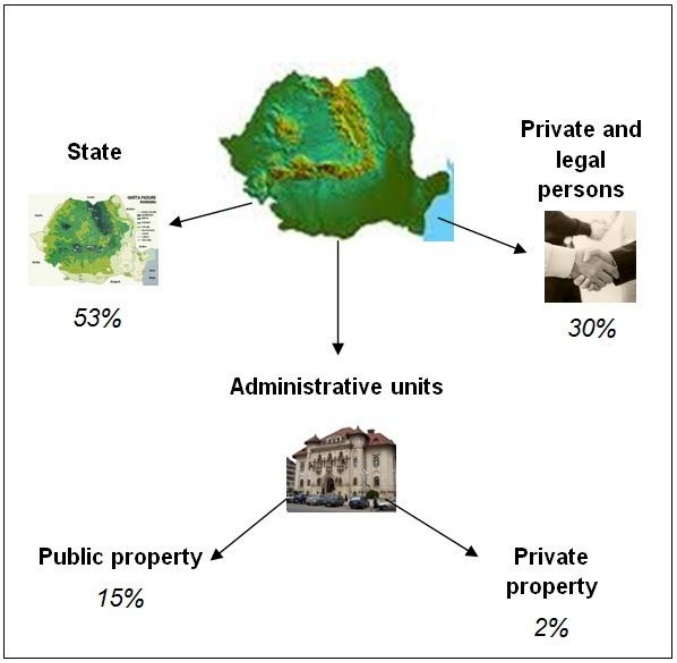
Apuseni Nature Park

The characteristic of the park is the karstic landscape which exhibits a wide variety of shapes: cliffs, steep valleys, lapis, caves, underground waters.

Piatra Altarului Cave *Landscape in Apuseni Nature Park /Apuseni Nature Park Administration)*

Organization of Forestry - Romania

Nowadays, the area covered by forests is about 6.5 million hectares. In the past forests covered about 18 000 000 ha in Romania. At the end of the 19th century the forest coverage was reduced to 40 % and in 1948 was stabilized at 27 %. According to the forest legislation forest coverage cannot decrease further. At the end of 2008, state forests were about 53 % and 47 % belonged to private and legal persons and administrative units as presented below:



State Forests are managed by the National Forest Administration called Romsilva, which is supervised by the Minister of Environment and Forests. Romsilva is divided into 41 forest districts that are coordinated directly by the General Manager. Forest administrative units are the basic forest divisions and they are part of the forest districts.

Due to the forest law forests are managed according to forest management plans for productive stands which are valid for 10 years. For poplar, willow and other fast growing species, forest management plans are valid for a period of 5 or 10 years.

Forest characteristics and forest types – Slovak Republic

Forest area in Slovakia has been expanding throughout the years. Today, according to the National forest inventory data (2005-2006), the forest area accounts for 44,3% of the country's territory. Forests, according to their function are classified as commercial (2/3), protective(1/6) and forests of special purposes (1/6). Protective forests include stands that have mainly protective functions, such as soil protection and others. They are located on extremely unfavorable sites such as high mountainous areas in the zone of dwarf pine.

In general, Slovak forests have a great diversity and a relatively even tree species composition. Beech covers the largest forest area (1/3) and other species follow such as spruce (1/4), oaks (1/10), fir, larch, hornbeam, maple, ash, and other broadleaved trees. Forest composition and species diversity is an indicator of forest stability and health. Furthermore, mixed coniferous and deciduous forests provide an overview of species diversity. In Slovakia, deciduous forests dominate (they cover approximately 50%), while pure coniferous stands cover only 20%. The proportion of coniferous and deciduous species in a region corresponds with the proportion of coniferous and deciduous in the whole country.

Share of Slovak forest is about 45 % from total land

Typical and exceptional fauna and flora species in forests – Slovak Republic

Slovak forests are habitats for many typical middle European mammals. Hunting is a long tradition in the country. The main species are: red deer, roe deer and wild boar. There is a large number of introduced species such as mouflon and fallow deer. Small animals can also be found such as European hare and European rabbit, as well as feather animals such as pheasant (200 ths) and partridge.

Wild boar belong to main hunting game

Roe deer is in Slovakia very numerous

Populations of large predators, such as bear, wolf and lynx have statistically increased in the past few years. According to data, more than 1,000 bears, wolves and lynxes live in Slovakian forests. The population of other rare game species has also increased, except for capercaillie whose population has decreased. Hunting of rare game species (e.g. brown bear, European wolf or European lynx) is strictly regulated in Slovakia. Although every year hunting of 50-60 bears is permitted, only 10-20 bears are actually killed. On the other hand, the number of chamois has increased to 600-700 individuals. There are only a few wild herds of European bison in open air.

In 2001, protection programmes for 2 animal species – *Emys orbicularis,* and *Rupicapra r. tatrica,* were developed. Moreover, supporting material for protection programmes for another 2 animal species - *Umbra crameri* and *Aquila pomarina* was developed.

In Slovakia there are various ecological conditions, which create diverse forest types with their own typical vegetation. The main tree species which create altitudinal vegetation zones are: sessile oak, European beech, silver fir, Norway spruce and dwarf pine. In Slovakia, we can distinguish eight altitudinal vegetation zones: Oak, Oak-Beech, Beech-Oak, Beech, Beech-Fir, Spruce-Beech-Fir, Spruce, and Dwarf pine.

Sessile oak has its ecological and production optimum in the 3rd altitudinal vegetation zone. **European beech** has its ecological as well as production optimum in the 4th altitudinal vegetation zone. However, beech can grow quite well on various sites in various altitudes. In some cases, under the appropriate conditions, it even reaches at the timberline. European beech very often forms forest stands with **silver fir** which on the contrary has a narrower ecological amplitude. **Norway spruce** dominates in higher elevations and it is the main species found at the timberline. It has its production optimum in the 5th altitudinal vegetation zone, where the long growing season and the sufficient amount of precipitation create the appropriate conditions for spruce to grow. At the timberline, Norway spruce neighbours with **dwarf pine.** Dwarf pine dominates in the 8th altitudinal vegetation zone, although, in lower altitudes, it can grow sparsely with spruce.

Spruce forest cover ¼ of all forests, predominantly in northern and high altitude regions

Most abundance has beech, which often reaches good wood quality

Black locust belongs to introduced tree species

As in other countries, in Slovakia, there are several endangered flora species under state protection. Totally, there are about 800 taxons under state protection (according to a Resolution of the Ministry of Nature Conservation of Slovak Republic). There are 220 endemic vascular plants. 7 fungus species, 140 lichens and 95 bryophytes are critically endangered. Endangered vascular plants account for 30%. In 2001, protection programmes were developed for the following vascular plants: *Drosera anglica, Orchis coriophora, Ophrys holubyana, Rhynchospora alba, Lycopodiella inundata, and Scheuchzeria palustris*.

The following tree species have been introduced in Slovakia: Douglas fir, Black locust, Euroamerican poplar (almost 0,5%), Grand fir, Eastern white pine, Red oak, Sweet chestnut, Horse chestnut and Box alder. Black locust covers a proportion of almost 2%.

Status of chamois is in last years increased and stabilized

Rare central European herbivores represent a few exemplars of European bison

Rescue programs develop for preservation of rare vascular plants (Drosera)

Carpathians primeval forests are under UNESCO protection (Stužica)

Forms of nature protection such as national parks and Natura 2000 sites - Slovak Republic

Nature and landscape protection

Forests play a decisive role in the conservation of the environment and the maintenance of ecological balance. The total forest area under protection accounts for 23.1% of the national territory. Forests of the 2^{nd} – 5^{th} level of protection account for 72.6%. In Slovakia there are 9 national parks (NP) - Tatra National Park, Pieniny National Park, NP Low Tatra, NP Slovak Paradise, NP Low Fatra, NP Muránska planina, NP Poloniny, NP High Fatra and NP Slovak karst, 14 protected landscape areas (PLA), and 703 small-scale protected areas such as national nature reserves, nature reserves, nature monuments and protected sites.

Natura 2000

The *Natura 2000* Network in Slovakia includes 382 Sites of Community Interest (pSCIs) which account for 11.7 % of the Slovak territory. 86.5 % of these sites are forest land.

Forest areas under UNESCO protection are: the karst valleys of Slovakia; nature reserves of Tatra NP; natural and cultural landscape of the Danube River; mycoflora of the Bukovské vrchy Hills; and the Carpathian beech primeval forests featuring NNR Stužica – Bukovské vrchy Hills, NNR Havešová, NNR Rožok, and NNR Vihorlat. There are 477 different sites with 1,317 specimens of protected trees. Moreover, there are other protected sites and protected landscape elements (arboreta, orchards, gardens, etc.). Special Protection Areas (SPAs) are another category of Natura 2000 sites. The total area of SPAs accounts for 51.6% of Protected Areas.

Organization of Forestry - Slovak Republic

Forests under state ownership (53%) are managed by: Slovak Republic Forest Service, (50%), Forest-Agricultural Estate Service (1%), Tatra National Park Authority (2%). The above authorities belong to the Ministry of Agriculture of the Slovak Republic. Military Forests and Estates of the Slovak Republic (4%) belong to the Ministry of Defense of SR. State forests used by schools are 3%. The Technical University in Zvolen and the Secondary Forestry Schools in Banská Štiavnica, Liptovský Hrádok and Prešov use state forests on the basis of contracts with the Forest Service of the Slovak Republic.

Non-state forest ownership (47%) includes private, municipal, church and forests with shared ownership.

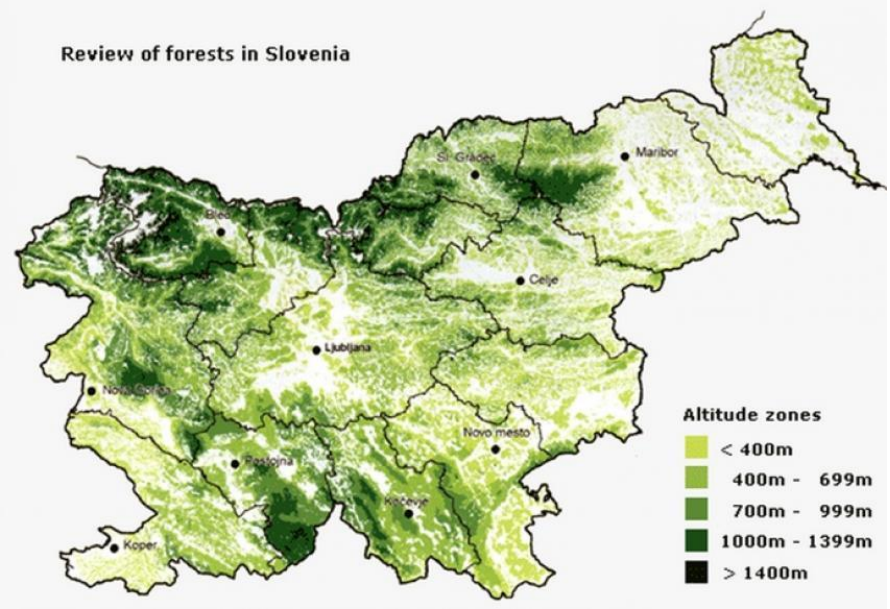
So far, public access to the forests is not forbidden, except for Military forests.

More as 95 % of forest in Slovakia are accessible to society

Forest characteristics and forest types - Slovenia

Forest diversity

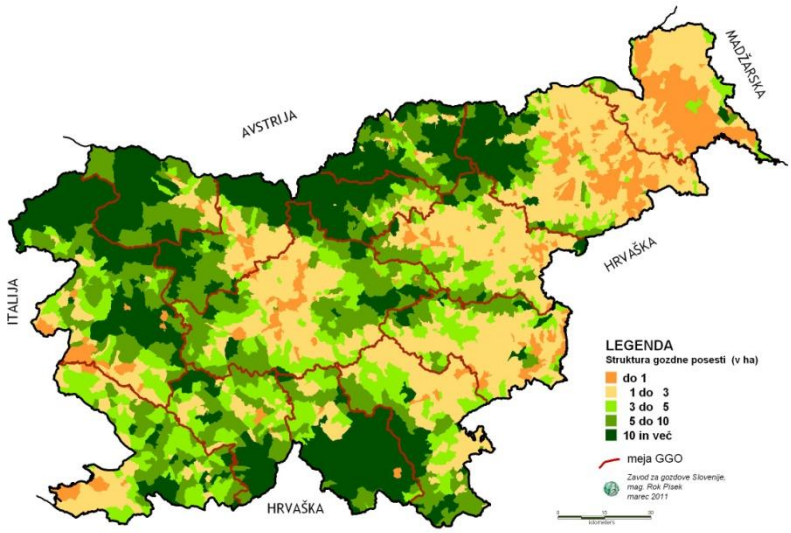
Slovenia is one of the European countries with the highest percentage of forest cover (58.4 %). Most Slovenian forests are located within the area of beech, fir-beech and beech-oak sites (70 %), which have relatively high productivity.



Picture 1: Forests according to the altitude zones (source: Slovenian Forest Service)

Forest ownership

74 % of forests in Slovenia are private and 26 % of forests are public (owned by the state or municipality). In larger and undivided state forests it is possible to have professional management. Private forests are small, with an average area of only 3 ha, which can be further fragmented into more plots because the number of forest owners is increasing, thus these forests are of no economic interest. According to the latest data, there are already 461,000 forest owners in Slovenia (including co-owners). The increased number of private forest plots and the increased number of forest owners prevent professional work in private forests, optimization of timber production and exploitation of forest potential.



Picture 2: Forest ownership status (source: Slovenian Forest Service)

Growing stock, increment and cut

According to data from forest management plans by the Slovenia Forest Service, the growing stock of Slovenian forests amounts to about 334 million m^3. In Slovenian forests there is an annual increment of about 8.3 million m^3.

In recent years the cut in Slovenian forests amounts to about 3.9 million m^3annually, 60 % of which are conifers and 40 % deciduous trees.

Tab. 1 - Changes in the forest area in Slovenia in the period 1875 - 2003

Year	Forest area (000 ha)	Forest cover (%)
1875	737	36
1947	879	43
1961	961	48
1970	1026	51
1980	1045	52
1990	1077	53
2000	1134	56
2001	1143	56
2002	1150	57
2003	1158	57
2004	1164	57
2005	1169	58

Picture 3: (source: Slovenian Forest Service)

Typical and exceptional fauna and flora species in forests - Slovenia

Conditions and Forest Diversity

Slovenia is characterised by great natural diversity, because of the range of geological conditions, the diverse uneven relief and the fact that the country has continental, alpine and sub-alpine climates. Due to its geographical position and uneven relief, Slovenia is influenced by the Mediterranean, the Alps and the Pannonian Lowlands. Because of the varied climatic conditions, a highly diverse vegetation structure can be found in the relatively small area of Slovenian forests.

Most Slovenian forests are found within the area of beech (44 %), fir-beech (15 %) and beech-oak (11 %) sites, with a relatively high productivity. Sites of thermophile deciduous trees and pines, covering only about 12 % of Slovenian forest area, have reduced timber production.

Nature favors broadleaves

In Slovenia, only 71 tree species (10 coniferous and 61 deciduous) grow naturally. In Slovenia forests have been influenced by humans less than in most Central European countries because of the mountainous character of the country and the difficult access to Karst region. Hence, there is a high percentage of less accessible forests, relatively well protected, which is proved by natural tree species diversity and forest structure (vertical and horizontal). However, it has been proved that the actual tree composition differs greatly from the potential vegetation. The ratio between coniferous and deciduous trees is 48:52 (2000), while the potential ratio for these site conditions is 20:80.

The difference between actual and potential share of spruce is due to spruce planting in the distant past. Spruce was to a great extent introduced into deciduous sites (mainly beech sites). In the 18th and 19th century, forests structure and species distribution was greatly changed due to large scale felling and planting of spruce.

Pine has become a typical tree species of the Slovenian Karst. It was planted there in the second half of the 19th century in order to reduce the impact of the strong "bora" wind and to turn the barren rocky karstic landscape into green again.

Home of brown bear, wolf and lynx

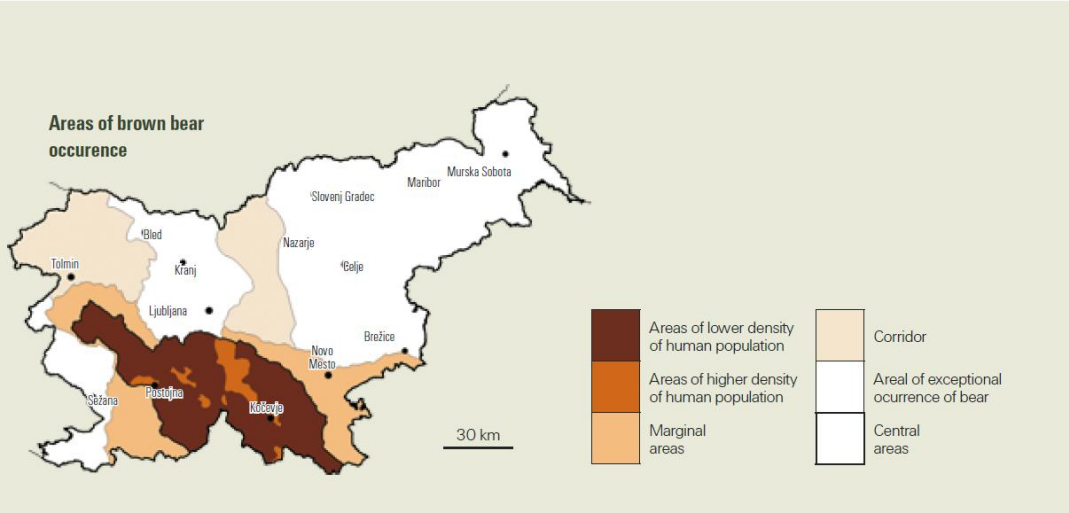
High diversity of habitats and biotic communities that have developed through years has formed many different ecosystems in the relatively small Slovenian country and numerous animal species have thus found a home. Above all, many amphibians and mammals are linked to forests. Slovenian forests are home to 950 plant species (47 of which are endangered) and 70 mammals (25 of which are endangered).

Brown bear has first found shelter in the region of Kočevje and Notranjska – still its main habitat – since 1889. This did not happen with lynx which became extinct and was later reintroduced.

Slovenia is one of the few European countries in which we can find brown bear, wolf and lynx.

Picture 4: Brown bear (source: Slovenia forest service)

Picture 5: Lynx (source:Slovenia forest service)



Picture 6: Brown bear habitat (source: Slovenia forest service)

Tab. 2 - A survey of endangered and other plant and animal species dependent on forest.

	endangered species dependent on forest	species dependent on forest	all endangered species	all species in Slovenia
Plants	47	950	330	3000
Amphibians	11	17	18	19
Reptiles	10	10	20	20
Birds	46	95	116	365
Mammals	25	70	29	79

Picture 7 (source: Slovenia forest service)

Forms of nature protection such as national parks and Natura 2000 sites - Slovenia

For a relatively small country, Slovenia offers a unique mosaic of biological, geographical and cultural diversity, with many natural objects and monuments of significant European cultural heritage. Protected natural areas account for around 12.6 %, Natura 2000 sites account for 36 % and 15.000 nature objects are protected as “valuable natural features”.

According to the international IUCN categorization in Slovenia there are the following protected areas:

Large protected areas or nature parks:

• 1 national park (IUCN: II/V)

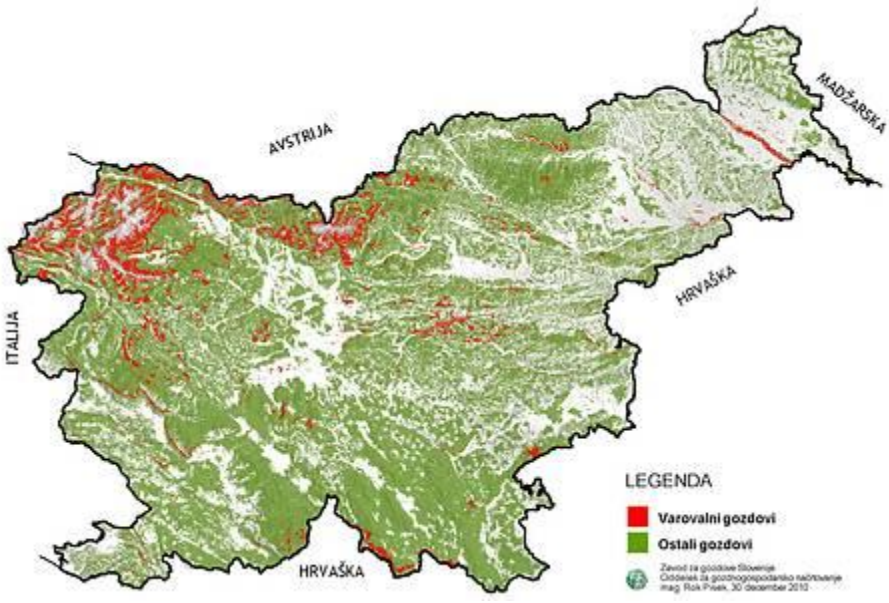
• 3 regional parks (IUCN: V/II)

• 44 landscape parks (IUCN: V)

Small protected areas:

• 52 nature reserves (IUCN: IV and I)

• 1217 natural monuments (IUCN: III)



Picture 8: Protective forests (source: Slovenia forest service)

Organization of Forestry - Slovenia

Slovenian Forest Service is divided into 14 regional units. Forest management and forest exploitation are under the responsibility of the Ministry of Agriculture and Environment (the supreme state forest institution) and of the Slovenian Forest Service (public forest service).

The main legal texts for forest management are:

– The Forest Act of the Republic of Slovenia (1993), which regulates protection, silviculture, exploitation and forest uses according to forest management plans;

– The National Forest Programme of the Republic of Slovenia (1996), adopted by the National Assembly, which defines the national forest policy on close-to-nature forest management, the guidelines for forest conservation and development, forest exploitation and multipurpose uses.

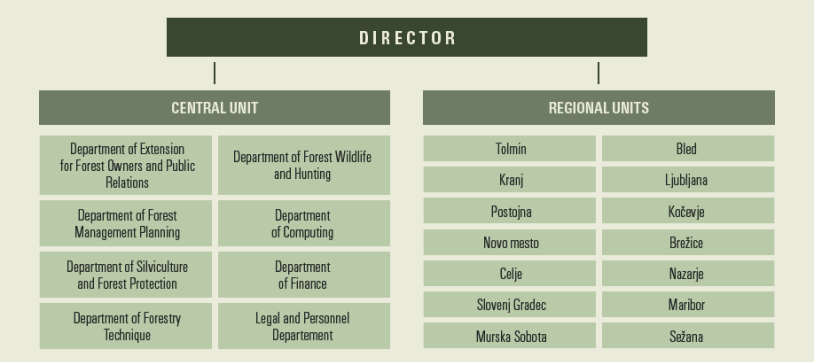
Moreover, there are acts which regulate the framework of nature protection, environmental protection, spatial planning, plant conservation, game management and wildlife, building and construction, public awareness.

Forest management plans include:

– regional forest management plans and plans of forest management units,
– silvicultural plans,
– regional game management plans.

Fundamental principles of forest treatment and management are:
– sustainability
– close-to-nature management
– multi-purpose management

Slovenian forests are managed by forest owners who are:
– private owners (natural and legal persons),
– local communities,
– state.



Picture 9: Structure of Slovenia Forest Service (source: Slovenia forest service)

Picture 10: Organization of Slovenia Forest Service (source: Slovenia Forest Service)

Forest characteristics and forest types - Switzerland

Switzerland is a country in the western part of Europe, with a total area of 41 290 km2. It is one of the most mountain countries in the world and does not have access to the sea. It can be divided into three parts, according to its diverse land structure: the Alps (southern, south-western and eastern parts of the country - 60 % of the country), the Swiss Upland (approximately 30 % of the country) and the Jura mountains (14 % of the country). In Switzerland we can find a lot of lakes (around 15 thousand, most of them have a glacial origin), gorges and valleys. On the Swiss Plateau there is a temperate oceanic or sea climate, while in the Alps, the Alpine climate.

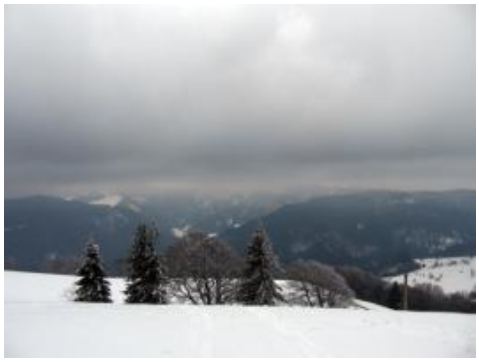
Switzerland lies within the mixed forest zone where deciduous forests dominate. Forests account for 31 % of the country, 13.9 % of which are classified as being primary forests. Since the nineteenth century, the afforestated area has increased by 45%. Currently, the Swiss forest area accounts for 12 786 km^2.

Changes in forest cover since 1990 are as follows:

- 1990 – 1 151 thousand hectares
- 2000 – 1 194 thousand hectares
- 2005 – 1 217 thousand hectares
- 2010 – 1 240 thousand hectares

On average, it is assumed that every year, forest cover increases by approximately 0.4 %.



Typical and exceptional fauna and flora species in forests - Switzerland

In Switzerland the flora and fauna is very diverse, with nearly half of the 40 thousand plant, animal and fungus species living in forest ecosystems. 70 % of forest is covered by beech and spruce.

In Switzerland there are 513 species of amphibians, birds, mammals and reptiles, of which 2.5 % are endangered. Due to the valuable and rare flora and fauna, 28.7 % of Switzerland is protected (according to the International Union for the Conservation of Nature). About 20 % of plant, animal and fungus species in forest areas (6 000 species) are living on dead wood. Swiss forests are rich in vascular plants. There are about 1 300 species, of which 8 % are considered to be at risk of extinction.

One of the main challenges for Swiss forest strategy is to maintain genetic diversity and to regenerate stands. Fir stands are replaced by deciduous species. Plants used for afforestation are native species.

Forms of nature protection such as national parks and Natura 2000 sites - Switzerland

Some of the different forms of nature protection in Switzerland are:

The Swiss National Park is the only national park in Switzerland. It covers an area of 174.2 km² and was founded in 1914. It is situated in the area of the Rhaetian Alps and in 1979 it was considered as an UNESCO Biosphere Reserve - Parc Suisse.

Entlebuch UNESCO biosphere reserve - is an area of 400 km^2 protected because of the unique bog and rock fields in an area that stretches for several kilometers.

Mustair UNESCO biosphere reserve - the only reserve in the Romansh linguistic area.

Organization of Forestry - Switzerland

Swiss forest stands can fascinate anyone with their diversity of species. They have a rich vertical structure, with most of the stands having high thickness and width, and including both mature trees and trees from the younger generation. The forest economy is based on a non felling scheme, and the process of regeneration is carried out according to natural methods.

The Swiss society knows how to benefit from the forest, taking from it all the best it has to offer, but at the same time guaranteeing the correct development of multi – species stands. Anyone who loves nature can enjoy these forests, which by experts are said to have a thorough fell structure. This means that we can meet all the phases of development in these forests, from seedlings to old, mature trees. All these different layers overlap to form a natural wall which protects forest from the negative effect of external factors. These forests are very resistant to strong winds.

In Switzerland, the harvested timber amounts to 5,000,000 m^3, which represents approximately 70 % of the annual increment.

Harvested timber is used for:

• energy production - 37 %

• construction of buildings - 24 %

• paper production - 22 %

• construction of furniture and other items from wood - 17 %

Main functions of forests In Switzerland:

• manufacturing - 40 %
• protective (including soil and water) 1 %
• biodiversity conservation - 7 %
• social - 5 %
• other - 40 %
• unknown - 7 %

In addition to protection against natural hazards such as erosion and flooding, forests can infiltrate air and water, thus contributing to maintaining their purity. Rivers flowing through Swiss forests are clean and the water in them is suitable for direct consumption.

The ownership status of Swiss forests is:

• public - 71 %
• private - 28 %

Private ownership is as follows:

• individual ownership - 87 %
• businesses and institutions - 13 %

Forests also provide a place of recreation for the residents. Everyone has the right to enter the forest and collect the fruits of the forest for their own needs. Admission to all forms of forest ownership in Switzerland is free of charge. Collecting fungi is of little importance for forest management, but may be important in local communities. The value of collected mushrooms in the forests of Switzerland is estimated annually at 8 million Swiss francs.

Forests in Switzerland, because of their favourable climatic and geological conditions, are some of the most impressive in Europe. Switzerland is a country where the level of forest sciences is at a very high level. Residents of Switzerland appreciate all the features offered by the forest. The protective functions of the forest that provide shelter against floods, snow avalanches and rock falls make it possible for people to have a secure life in the valleys.

The Swiss spend a lot of free time, during weekends and holiday periods, wandering around impressive woodland areas. They can enjoy the forest without exposing it to destruction, fires and littering.

Forest characteristics and forest types - Ukraine

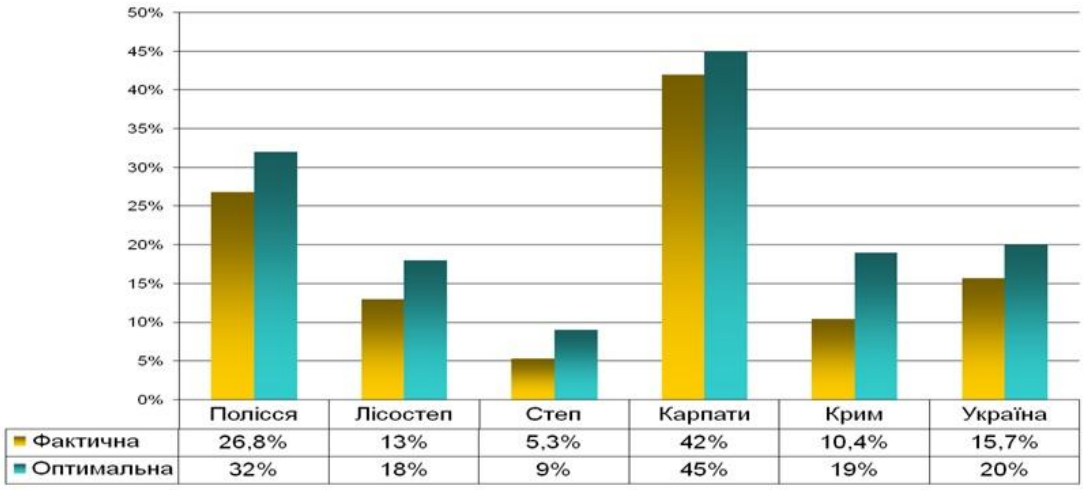
The first information about Ukrainian forests can be found in ancient literature. Herodotus had written about forest in Oleshye region. Depending on their use and distribution forests in Ukraine fulfil various functions such as recreational functions, retaining water, environment protection. Furthermore, they satisfy the needs for forest products.

15.4% of forests are natural reserves and they tend to grow. In Ukraine, there is a rather low average level of forest cover, which is 15.7 % of the overall Ukraine area. Over the past 50 years, the rate of afforestation has increased by almost 1.5 times, and wood supply by 2.5 times. In the years following the proclamation of Ukraine's independence, the percentage of forest land increased by 1.4% (in 20 years).

The growing stock is estimated at 1.8 billion m^3 and the average annual increment reaches 35 million m^3. The gradual increase of growing stock in forests, confirms the considerable economic potential of Ukraine forests. Ukraine holds the 8^{th} place in Europe (excluding the Russian Federation) for its growing stock compared to the country's forest area.

Forests in Ukraine are located in various vegetation zones: Polesie, forest-steppe, steppe, Ukrainian Carpathians and Mountainous Crimea , in which there are important differences regarding afforestation and forest management.

Afforestation in Ukraine according to vegetation zones.



	Polesie	Forest-steppe	Steppe	Carpathians	Crimea	Ukraine
actual	26,8 %	13 %	5,3 %	42 %	10,4 %	15,7 %
optimal	32 %	18 %	9 %	45 %	19 %	20 %

Around half of the forests in Ukraine are artificially created and require intensive monitoring.

The malfunction of the Chernobyl Nuclear Power Plant (1986) has led to radioactive contamination of the northern forest areas of Ukraine.

Over the years the age structure of forests has been affected by the restoration of large forest areas in the post-war period. Thus, new forests were created in the years 1950-1970 of the past century. As a result, most afforestated areas include medieval forest stands (45%), whereas the average age of forests in Ukraine is over 55 years.

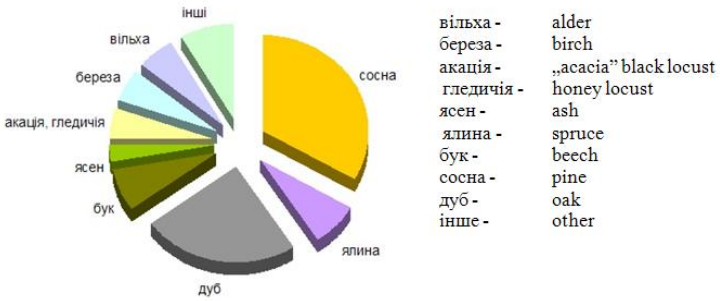
Typical and exceptional fauna and flora species in forests - Ukraine

Forests in Ukraine are distributed unevenly. They are mostly found in Ukrainian Carpathians and also in Polesie region. The Transcarpatian region with mountain fir *(Abies)* stands is known as the most wooded region in Ukraine.

Flora of Ukrainian forests is very rich due to diversity of climate zones. The total number of plants is approximately estimated. Ukrainian forests include more than 30 tree species such as: pine *(Pinus sylvestris)* as a dominant species, from which, until recently, pine sap - turpentine was extracted, oak *(Quercus robur)*, beech *(Fagus silvatica)*, spruce *(Picea abies)*, birch *(Betula pendula)*, alder *(Alnus glutinosa)*, ash *(Fraxinus excelsior)*, hornbeam *(Carpinus betulus)*, fir *(Abies alba)*.

Coniferous forest stands cover 42 % - mainly pine (33%). Deciduous forests cover - 43 %, -mainly oak and beech (32%).

Distribution of tree species in Ukraine



Hunting fauna of Ukraine forests

Fauna in Ukraine is historically part of the ecosystems (biocenosis). The most common hunting ungulates in forests are the following: European roe deer (143 600), wild boar (58 600), moose (5 600), red deer (16 000), spotted deer *(Axis axis)* (4 300), fallow deer (3 400) and mouflon (500).

Hunting fur animals are the following: hare, fox, muskrat, marten, squirrel, bobak, beaver. Feathered animals are the following: duck, coot, pigeon, quail, partridge, pheasant, goose.

Forms of nature protection such as national parks and Natura 2000 sites - Ukraine

In 1994 Ukraine ratified the Convention on Biodiversity. Currently, the percentage of forests under protection on the territory of Ukraine is 5.4%. The State Agency of Forest Resources has approximately 35 % of the natural protective state resources. 15.4 % of the forests, which are subordinate to the State Agency of Forest Resources, are already under protection.

It should be noted that within 30 years the percentage of forest land under protection has increased by almost 3 times. The high percentage of forest Nature Reserves in Ukraine proves that strict criteria regarding forest management have been imposed. The above mentioned criteria meet the requirements of the Pan-European Strategy for the maintenance of biological and landscape diversity.

In addition, since 1961 the percentage of forest under protection has increased from 34% to 50%. In general, in Ukraine, production is not permitted in 40 % of the forests. There were established more than 3.1 thousand areas and monuments of natural protection, covering 1.2 million ha of forests belonging to the State Agency of Forest Resources.

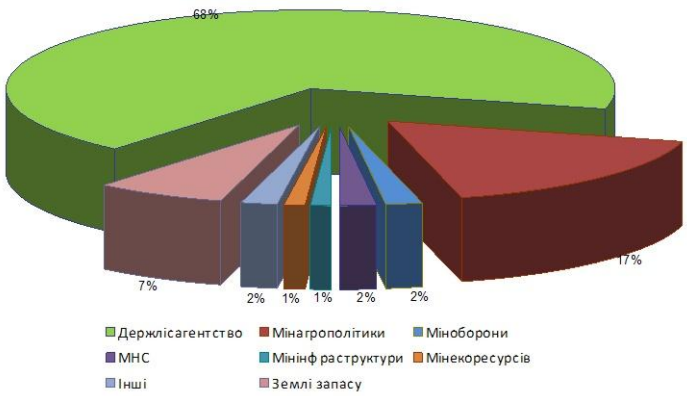
The State Agency of Forest Resources manages 12 nature protection areas (6 nature reserves, 5 national parks, 1 nature and economic park). It also manages 1,303 temporary reserves, 32 regional parks, 15 dendrology parks and 42 parks with garden art particularities.

With the support of the Ministry of Agriculture, Environment and Quality Nutrition of the Netherlands and the Ministry of Ecology and Natural Resources of Ukraine in the Ukrainian Carpathians, the pilot project BBI - MATRA is implemented. The name is as follows: "Specification and classification of biotopes in Ukraine: introduction of standards and methodology of the European Union".

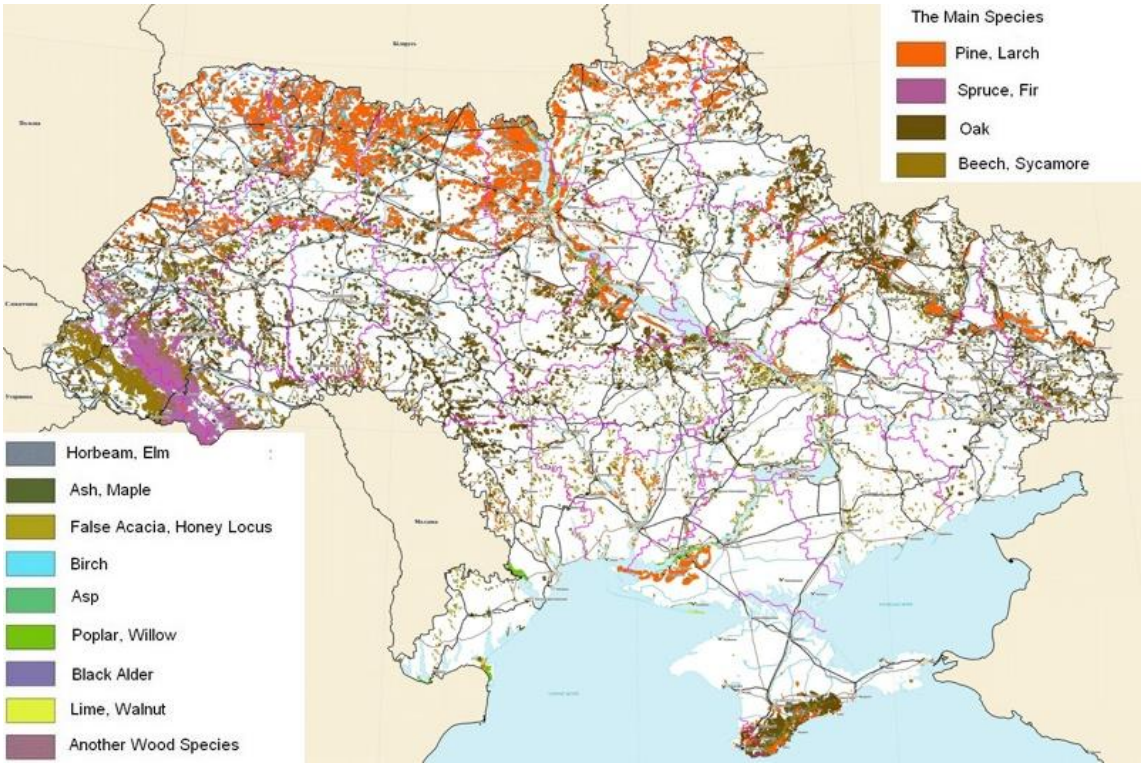
Organization of Forestry - Ukraine

Forests are granted by the State to companies, institutions and organizations, ministries and departments for permanent use. Some of them are: National Agency for Forest Resources (68 %), Ministry of Agricultural Policy and Catering - (17 %), Ministry of Defence (2 %), Ministry of Emergency Situations (2 %), Ministry of Ecology and Natural Resources (1 %), Ministry of Infrastructure (1 %), other ministries and departments - (2%), land belonging to the state (7 %). Foresters can use forest for productive reasons but they are also responsible for ensuring the health and stability of forests. Of particular importance is fire prevention especially in the period in-between the end of winter and the beginning of the early humid autumn.

Distribution of forest resources of Ukraine according to departmental subordination



Держлісагентство – National Agency for Forest Resources
Мінагрополітики – Ministry of Agrarian Policy and Catering
Міноборони – Ministry of Defence
МНС – Ministry of Emergency Situations
Мінінфраструктури – Ministry of Infrastructure
Мінекоресурсів – Ministry of Ecology and Natural Resources
Землі запасу – state land
інші – Other



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