



# Young People in European Forests



**YPEF**  
**European contest**  
**about forests and**  
**forestry**

Educational material  
Fifth edition, 2015

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## European Forests

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.

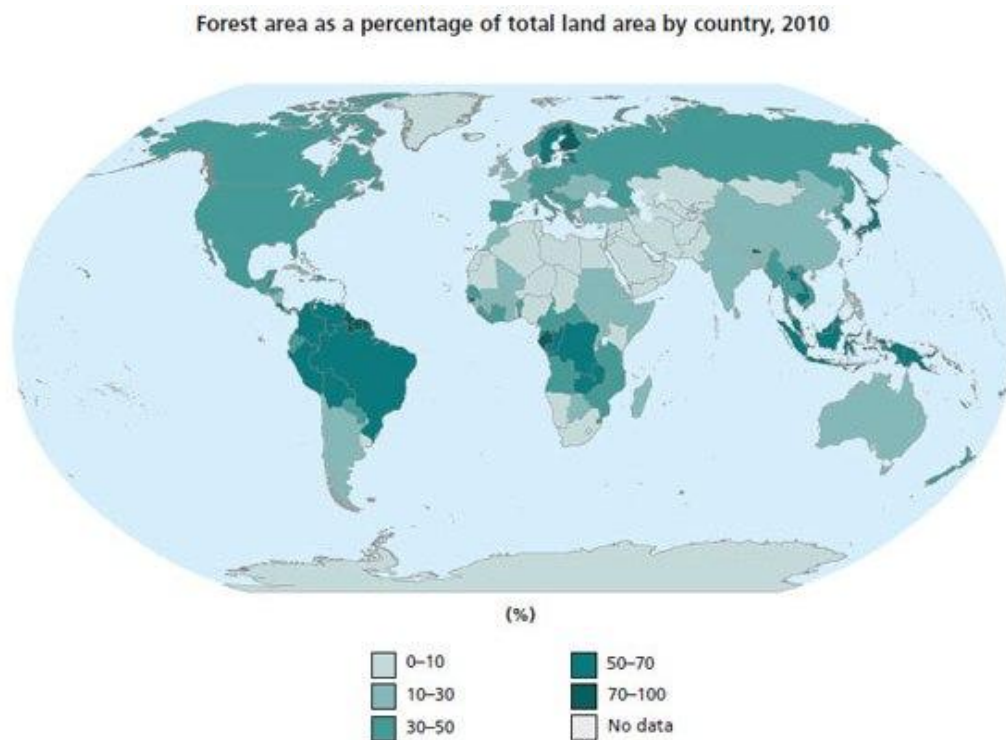


Fig. 1: Forest area as a percentage of total land area by country, 2010. Source: FAO, 2013

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.



Photo 1: Wonderful Forest.  
Source: Robert Pache

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.

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...

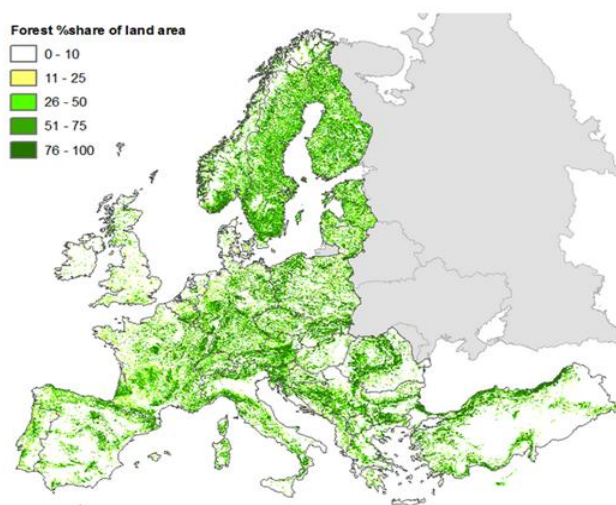


Figure 1: IRS- and SPOT-based forest cover map of the EC Joint Research Centre (Kempeneers et al. 2011), aggregated to 1km x 1km.

Fig. 2: IRS- and SPOT-based forest cover map of the EC Joint Research Centre. Source: Kempeneers et al., 2011

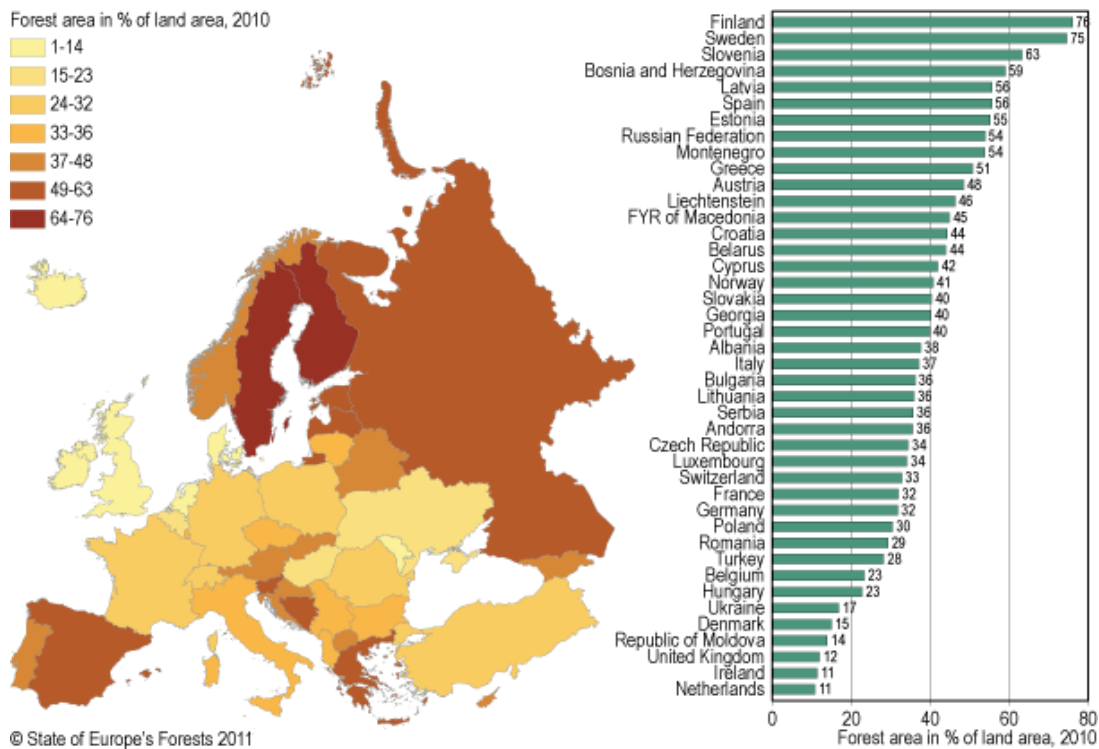


Fig. 3: Forest cover in Europe, as percentage of land area. Source: Forest Europe 2011.

**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.

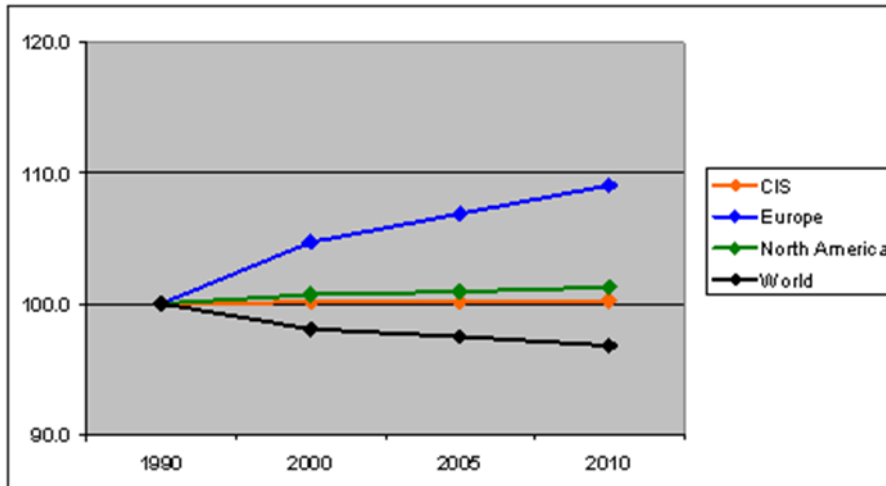


Fig. 4: Change of forest area in the UNECE region (in relation to the area of 1990). Source: FAO FRA, 2010.

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.

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.



Photo 2: Oak Forest.  
Source: Robert Pache

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).

### **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.

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 stands in greater forest areas. Reconstructing tree stands is an action beyond the prospect of financial profit within one or two decades. The durability and importance of these reconstructed tree stands is not counted in terms of money.

### **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).



Photo 3-4: Fruits of a Coniferous tree and fragile seedling. Source: Robert Pache

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.

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 stands (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 stands 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).



Photo 5: Beech forest in Germany.  
Source: A. Schilling

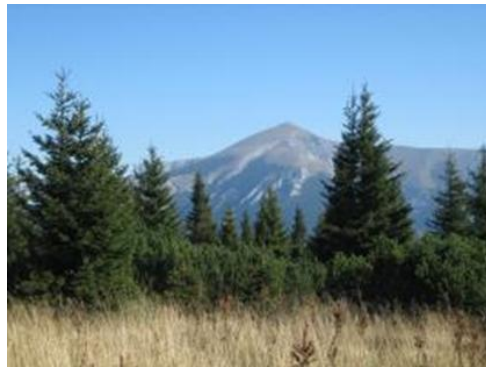


Photo 6: Mountain forest in Austria.  
Source: YPEF Austria

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<sup>3</sup>/ha, while growing stock in Ireland, Greece and Spain are below 100 m<sup>3</sup>/ha. In the alpine countries these numbers are much greater due to high rainfall and large tree stands of fir and spruce. In Austria it amounts to 309 m<sup>3</sup>/ha, in Slovenia and Germany - around 280 m<sup>3</sup>/ha. Forests in Slovakia and the Czech Republic have an average of 260 m<sup>3</sup>/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<sup>3</sup>/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.



Photo 7: Maritime pine stand.  
Source: YPEF Portugal

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 stands. 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).



Photos 7-8: Old growth forests. Source: Robert Pache

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.

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.

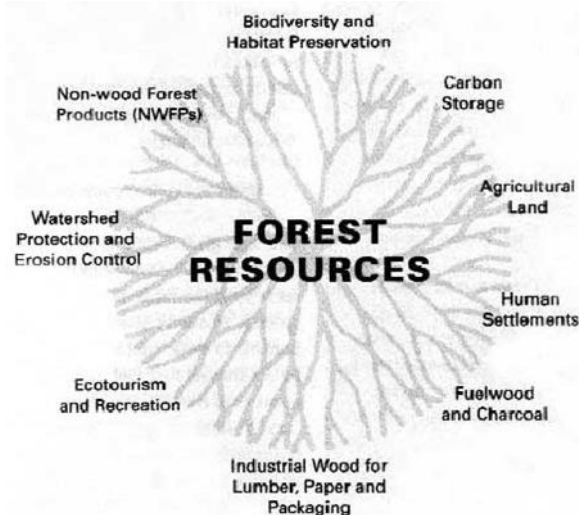


Fig. 5: Forest resources. Source: Adapted from Sten Nilsson, Do We Have Enough Forests? 1996

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

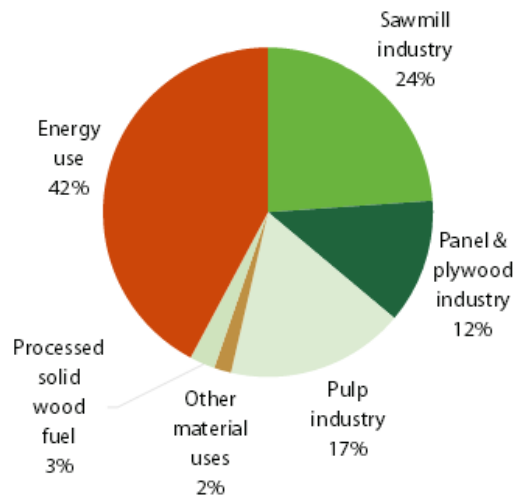
Forests in Europe are usually preserved in areas unsuitable for agriculture. There is also a small percentage of forests untouched by human intervention. Virgin forests (ancient / pristine / old-growth /primary) which are not affected by man account for about 4% of all forests of Europe, although defining 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.

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.

**Figure 1.3:** Wood resources use in the EU-27, 2010  
(% share of total volume in m<sup>3</sup>)



Source: EUwood, 2010

Fig. 6: Wood resources use in the EU-27, 2010. Source: EUwood, 2010

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.



Photos 10-12: Forest works. Source: YPEF

### 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. 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.



Photos 13-15: Gall and Pests. Source: Robert Pache

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.



Photo 16: Forest after fires.  
Source: YPEF Portugal

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.



Photos 17 and 18: Listen to the silence of a forest and Picnic at the forest. Source: A. Schilling

**Nature conservation and Policy framework**

European policy regarding protected areas is mostly the product of initiatives from two main sources: the United Nations Convention on Biological Diversity, and the European Union itself.



Photo 19: Children around a tree, which is protected.

Source: Astrid Schilling

The UN Convention on Biological Diversity is an international treaty which almost 200 countries signed. The Convention states that, as far as possible and appropriate, parties shall “establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity”. The following international and pan-European conventions have been promoting the establishment of protected areas (EEA Report, 5/2012).

Conventions at the global level		
The Convention on Wetlands of International Importance (Ramsar Convention)	1971	The Convention on Wetlands is an intergovernmental treaty signed in Ramsar, Iran, and came into force in 1975. It is the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

The World Heritage Convention	1972	The World Heritage Convention was adopted by the General Conference of UNESCO, and links nature conservation and the preservation of cultural properties.
The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)	1979	The Convention on the Conservation of Migratory Species of Wild Animals was signed in Bonn, Germany and came into force in 1983.
United Nations Convention on the Law of the Sea	1982	The Convention has been ratified or acceded to by more than 150 states and the European Union. It governs all aspects of ocean space from delimitations to environmental control, scientific research, economic and commercial activities, technology and the settlement of disputes relating to ocean matters.
Convention on Biological Diversity (CBD)	1992	The objectives of the Convention are: conservation and sustainable use of biological diversity; and the fair and equitable sharing of the benefits arising out of the use of genetic resources. The CBD came into force in 1993.

Conventions at the pan-European level		
The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention)	1979	The Bern Convention is a binding international legal instrument in the field of nature conservation, which covers most of the natural heritage of the European continent and extends to some states of Africa. It was opened for signing in Bern, Switzerland, and came into force in 1982.
Alpine Convention	1994	The Alpine Convention sets out the basic principles and general measures for sustainable development in the Alpine region and includes the Protocol for the Implementation of the Convention in the field of Nature Protection and Landscape Conservation. The Convention entered into force in March 1995.
European Landscape Convention (Florence Convention)	2000	The European Landscape Convention promotes the protection, management and planning of European landscapes, and organises European cooperation on landscape issues. The Convention was adopted in Florence, Italy, and came into force in March 2004.
Carpathian Convention	2003	The Carpathian Convention, signed in Kiev, Ukraine, provides the framework for cooperation and multi-sectoral policy coordination, a platform for joint strategies for sustainable development, and a forum for dialogue between all stakeholders in the Carpathian region.

Fig. 7 and 8: Conventions on global and pan-European level. Source: IUCN

At EU level, two directives of the European Council have been particularly important for the creation of protected areas.

Directives of the European Union		
Directive 79/409/EEC on the conservation of wild birds (Birds Directive)	1979	The Birds Directive is the EU's oldest piece of nature legislation and one of the most important, creating a comprehensive scheme of protection for all wild bird species naturally occurring in the Union. Following numerous updates over the years, the codified version was published in 2009 (Directive 2009/147/EC).



Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive)	1992	The Habitats Directive forms the cornerstone of Europe's nature conservation policy. It is built around two elements: the Natura 2000 network of protected sites and the strict system of species protection.
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Fig. 9: Directives of the European Union. Source: IUCN

Europe has established other policy instruments which are important for the protection of the environment:

- as The London Convention Relative to the Preservation of Fauna and Flora in their Natural State,
- European Diploma of Protected Areas,
- Man and the Biosphere Programme (MAB),
- European Network of Biogenetic Reserves and
- Global Geoparks Network.

- **IUCN management categories**

According to the International Union for Conservation of Nature (IUCN) a protected area can include any area of sea, lakes, rivers or land that has been identified as important for conservation of nature, and managed for this purpose. Some protected areas allow industry, extensive agriculture or fishing to occur within their boundaries, while others prohibit all of these activities.



Photo 20: Alder forest.  
Source: Administration of Biosphere reserve Schorfheide-Chorin, Germany

- **IUCN protected areas management categories system**

While a designation type often provides information about the purpose of a protected area, it does not provide information on the type of management applied in the individual site. In an attempt to describe and categorize the different management approaches in individual sites, the IUCN has identified seven different protected area categories, based on management objectives.

IUCN category		Description
Ia	Strict Nature Reserve	Strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphologic features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values. Such protected areas can serve as indispensable reference areas for scientific research and monitoring.
Ib	Wilderness Area	Usually large unmodified or slightly modified areas, retaining their natural character and influence without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.
II	National Park	Large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities.
III	Natural Monument or Feature	Protected areas set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave, or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.
IV	Habitat/Species Management Area	Protected areas aiming to protect particular species or habitats, their management reflects this priority. Many Category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.
V	Protected Landscape/Seascape	A protected area where the interaction of people and nature over time has produced an area of distinct character with significant, ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.
VI	Protected area with sustainable use of natural resources	Protected areas that conserve ecosystems and habitats together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area.

Fig. 10: IUCN categories. Source: IUCN

### Protected areas in Europe

About 25% of the EU 27 terrestrial land is protected under Natura 2000 or national designations or some combination of the two.

The size of Europe's designated areas varies greatly, ranging from an individual tree, to some million hectares (ha) for a site. Ninety per cent of sites are less than 1.000 ha, however. Protected areas provide a wide range of services in a context of increasing pressures and a rapidly changing environment.

For the vast majority of nationally protected areas (90%) the area is less than 1.000 ha and 65% range between 1 and 100 ha. The average size of the Natura 2000 sites is larger:

two thirds (68%) are less than 1.000 ha and almost a third of the sites are bigger than 1.000 ha (EEA Report, 5/2012).

Area size	Nationally protected areas (CDDA)	Natura 2000 sites
<1	12%	2%
1 - 100 ha	65%	33%
100 - 1 000 ha	16%	33%
1 000 - 10 000 ha	5%	23%
>10 000 ha	2%	9%

Fig. 11: Protected areas in Europe. Source: CDDA version 2011 and Natura 2000 data base, 2011

### Natura 2000 network

Natura 2000 is an EU-wide network of nature protection areas established under the 1992 Habitats Directive. The aim of the network is to assure the long-term survival of Europe's most valuable and threatened species and habitats. It is comprised of Special Areas of Conservation (SAC) designated by Member States under the Habitats Directive, and also incorporates Special Protection Areas (SPA) which they designate under the 1979 Birds Directive. It also applies to the marine environment. The total area of the Natura 2000 network represents approximately 18% of the total EU terrestrial area.

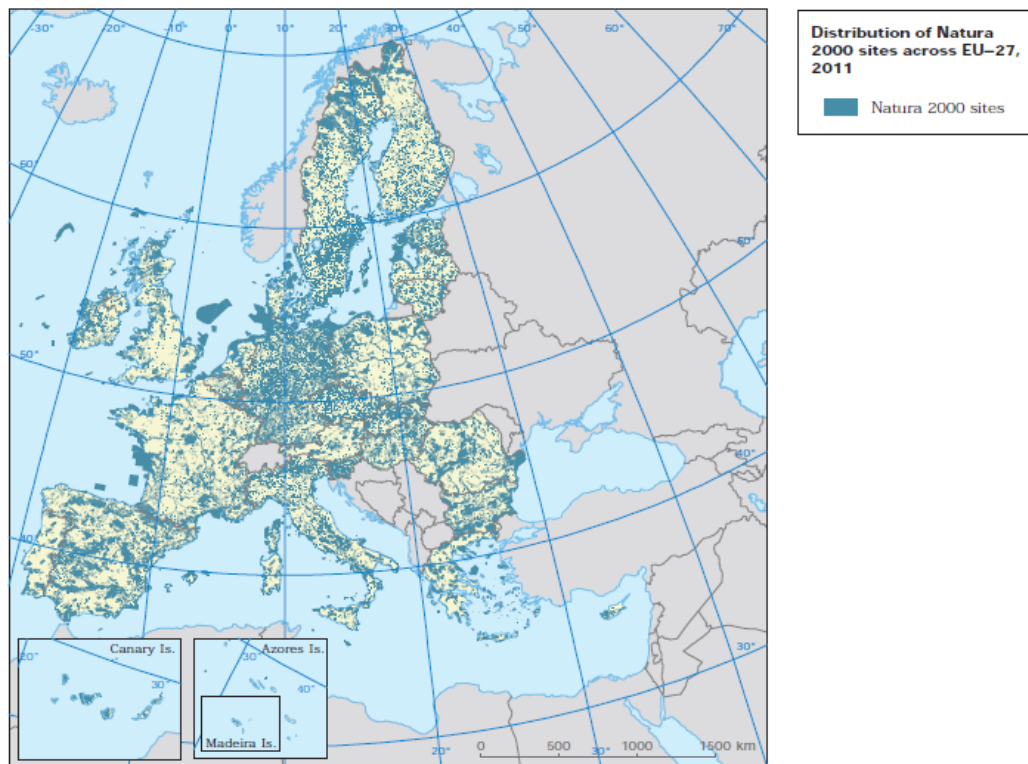


Fig. 12: Logo of Natura 2000.  
Source: ec.europa.eu

The establishment of the Natura 2000 network has been an important milestone and a turning point in the history of European protected areas. It is the most extensive protected area system worldwide, at the moment comprising more than 26.000 sites. The approach to designating sites under the Habitats Directive, building the Natura 2000 network and managing it is innovative, and includes several aspects that are unique for a piece of multi-national legislation on protected areas.

As a matter of fact, the concept of Natura 2000 builds on, but goes beyond the 'traditional' definition of "protected area": on the one hand it is based on strict provisions of an EU directive (hard law), on the other hand, it promotes the sustainable use of resources and the consideration of economic, social and cultural requirements for achieving the nature conservation goals (EEA Report, 5/2012).

Map 5.2 Distribution of Natura 2000 sites across EU-27, 2011



Source: Natura 2000 database, December 2011.

Fig. 13: Distribution of Natura 2000 sites across EU-27, 2011. Source: Natura 2000 database, 2011

The main goal of Natura 2000 is to contribute to the maintenance or restoration of a favorable conservation status for the target habitats (231 different types) and species (over 900 taxa). The notion and definition of “favorable conservation status” is one of the most distinctive and key aspects introduced by the Habitats Directive in European nature conservation policy, and clearly contribute to an outcome-oriented policy.

Another original aspect of Natura 2000 is its use of bio geographical regions. These bio geographical regions are used to both build the network and to identify target species and habitat types. This has been accomplished while recognizing the ecological differences within and between EU Member States; a fact that was particularly important after the EU enlargement, which greatly increased the geographical area covered by the directives and the network (to the North and the East).

Building a network of sites across Europe on the basis of a common methodology, criteria and set of ecological features favors better ecological coherence than if the networks were only organized within each Member State. A European network helps migratory species, and allows for taking into account genetic diversity and ecological variability. It also facilitates the identification and designation of sites across borders that better take into account the natural distribution of species and habitat types.

Figure 5.3 Proportion of terrestrial land covered by Natura 2000

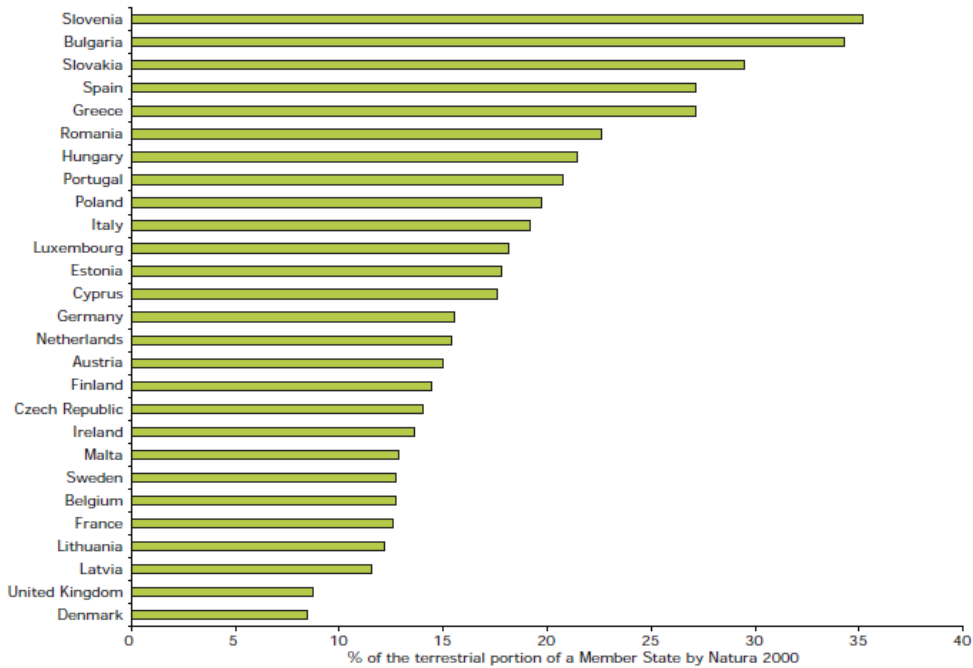


Fig. 14: Proportion of terrestrial land covered by Natura 2000. Source: Natura 2000 database, 2011.

Another unique aspect of the Natura 2000 network is the comprehensive set of provisions introduced by the Habitats Directive concerning conservation measures and assessments of impacts for projects likely to have a significant effect on the sites. The provisions are set in Article 6 of the directive, for which the European Commission has been issuing extensive guidance, from legal interpretation to practical guidance on specific sectors like wind energy.

Another distinct aspect of Natura 2000 compared to other regional networks of protected areas is the way it is financed through different EU mechanisms. Finally, Natura 2000 has been responsible for much research activity over the past twenty years. This research has comprised both applied research to help implement the directives, as well as research that studies the process of implementation itself.

- **Share of protected areas in selected ecosystems in Europe**

It is possible to estimate the extent of broad ecosystem-types within the total area of nationally protected sites in Europe. Forest ecosystems take up the largest share of nationally designated areas in EEA countries. Agro-ecosystems are the next largest, which are followed by grasslands and marine ecosystems.

Mountain areas generally offer greater opportunities for designing protected areas because competition for land use is much lower than in plains or in coastal areas. In addition, because they are generally more remotely located, mountain areas are important reservoirs of biodiversity. The factors leading to the protection of coastal areas are different.

They are usually the result of political will to protect areas against urbanization and infrastructure development (ports, roads, industrial plots), or due to natural limits on land use like strong natural dynamics such as erosion (EEA Report, 5/2012).

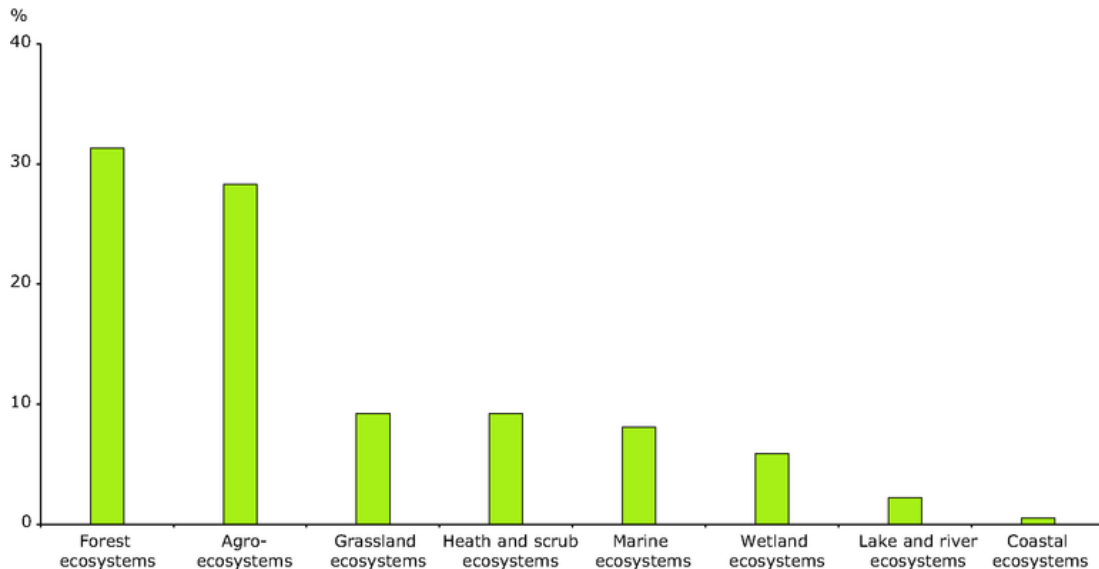


Fig. 15: Share of protected areas in selected ecosystems. Source: EEA Europa.eu

- **The type of forests included in Natura 2000**

Listed in Annex I of the Habitats Directive are over 70 different forest habitat types, of which many are classed as priority. Altogether, they correspond to a third of all the habitats covered by the Directive. The large number of habitat types in Annex I does not however imply an abundant resource. On the contrary, it goes to confirm their generally rare and residual nature.

Over 50% are restricted to just one or two countries (and in some cases to just one or two locations). Typical examples include: Fennoscandian wooded pastures found only in Finland and Sweden, Canarian endemic pine forests, Nebrodi fir forests of Sicily.... Only a handful of the more “common” and well known forest types such as alluvial forests, oakwoods and a variety of beech forests are present in the majority of Member States.

To help select sites for Natura 2000, Member States and the Commission agreed that they should focus specifically on the following:

- forests of native species, forests with a high degree of naturalness,
- forests of tall trees,
- presence of old and dead trees,
- forests with a substantial area and
- forests having benefited from continuous sustainable management over significant period.

These principles indicate that preference should be given to the forests with little human interference and/or to those already subject to sustainable management practices favoring biodiversity. It is estimated that two thirds of the sites included in the Natura

2000 network have at least one forest habitat type, which suggests they tend to form part of a complex matrix of habitats within a larger area.

The range of actions undertaken for forests is almost as diverse as the habitat types themselves. Many involve initial one-off restoration actions in order to bring the forest back up to its original high conservation state. Most also develop management plans in close collaboration with local stakeholders and forest authorities. Some go on to try out innovative ways of bringing together conservation with economic activities. Yet others focus instead on wildlife management issues, for instance, creating suitable habitats and corridors for woodland species such as bears and grouse (EEA Report, 5/2012).

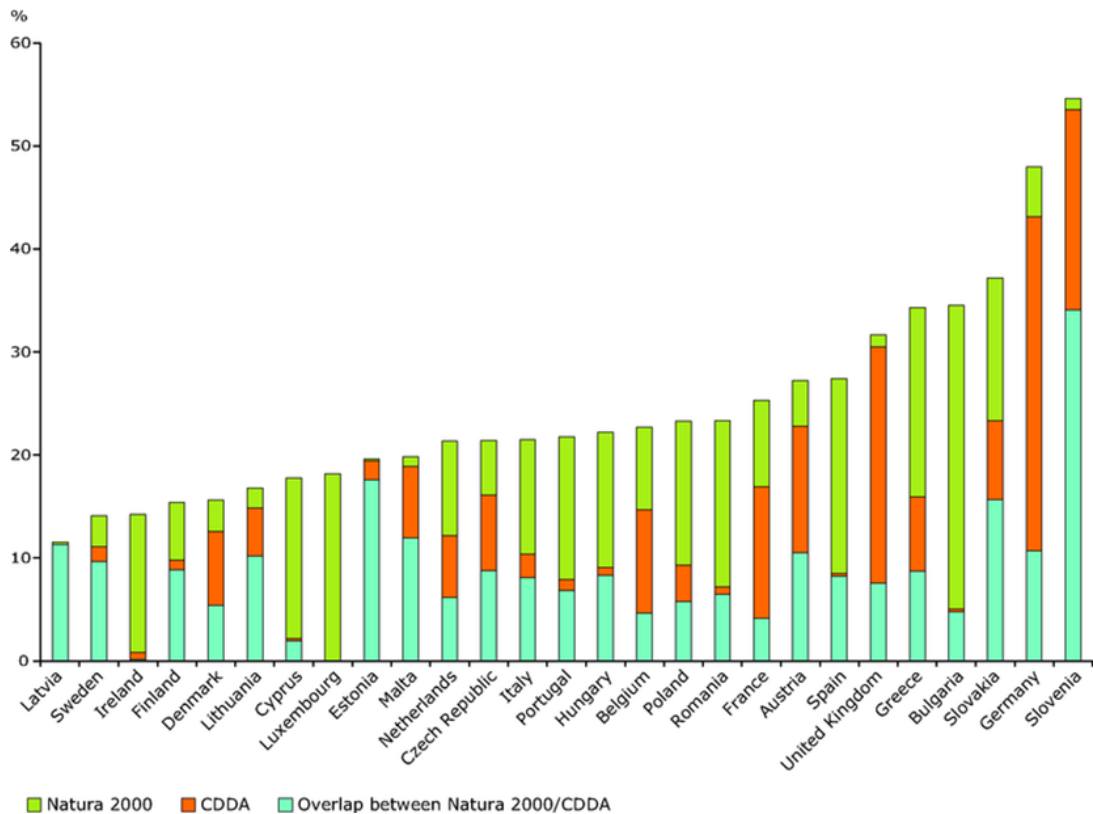


Fig. 16: Share of terrestrial area designated in EU Member States under Natura 2000 and national designations. Source: EEA Europa.eu

### Complementarity between national designations and international networks

The system of protected areas in Europe is complex, and in many cases, there is a complementarity and overlap between different designation-types at various levels.

- protected areas under Natura 2000 and national designation represents 25% of the EU-27 terrestrial land
- Natura 2000 overlaps with nationally designated areas on 7.7% of the EU land territory
- Natura 2000 covers 9.7% of the EU land territory beyond existing nationally designated areas
- 7.7% of the EU land territory is only covered by nationally designated areas

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- Natura 2000 contributes to 70% of the total surface area of protected areas within the EU-27.

There are some countries (such as Austria, Denmark, Estonia, Germany, Latvia, Lithuania, Malta, Slovenia, and the United Kingdom) where Natura 2000 nearly always overlaps with national designations (CDDA). But the situation is quite different in Bulgaria, France, Greece, Hungary, Italy, and Portugal, where many Natura 2000 sites do not overlap with existing nationally designated sites.

It is also remarkable to notice how in some countries (Austria, Belgium, Estonia, France, Germany, Slovenia and the United Kingdom), national designations significantly complement the Natura 2000 network in terms of area covered. Although a large part of these national designations are targeted at landscape protection or sustainable territorial development (IUCN management categories V and VI) and not specifically focused on biodiversity conservation, the main goal of Natura 2000 sites (EEA Report, 5/2012).



Photo 21: Young people in the forest. Source: Astrid Schilling



**Albania**

**Forest characteristics and forest types**

Albania is a small mountainous country in the Southeastern Europe. The surface area of Albania is 28.748 km<sup>2</sup> and nearly 11.000 km<sup>2</sup> are forested.

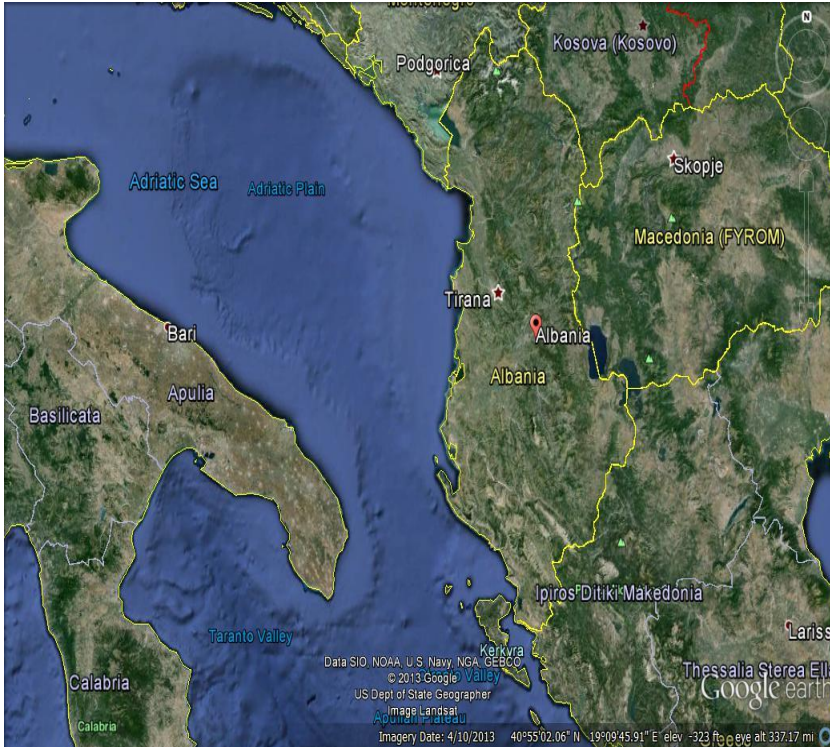


Fig. 17: Albania.  
Source: Google earth

Albania is well known for its high diversity of ecosystems and habitats. Within its territory there are maritime ecosystems, costal zones, lakes, rivers, evergreen and broadleaf bushes, broadleaf forests, pine forests, alpine and sub-alpine pastures and meadows, and high mountain ecosystems. The forest covers 36% of the total area; and pastures about or 15%; 24% agricultural and other lands 25%.

Forests are more extensive in the Northern, north-eastern regions. The forests have diversity of types, formations, plants and animals communities. There are high forests, low forests and shrubs. High forests represent the largest area covered in the country, 454.202,7 ha, followed by Low forests with 330.660,2 ha.

No.	Forest types	Area covered/ha
1	High forests	454.202,70
2	Low forests	330.660,20
3	Shrubs	257.927,10
4	Area with forests plants	29.090
	All	1.071.880.00

Fig. 18: Forest types in Albania. Source: E. Nuna

- **State of forests recourses**

- **Mediterranean shrub**

Mediterranean shrub, found mainly in the southern mountain region, consists mainly of evergreen shrubs (e.g. *Quercus ilex*, *Q. coccifera*, *Arbutus unedo*, and *Myrtus communis*, *Erica arborea*), deciduous shrubs and Mediterranean trees.

- **Oak woodland**

Oak woodland, found above the shrub zone, is composed of oak or mixed forests of oak, hornbeam, black pine, chestnut, ash, maple and linden. There are 12 oak species in Albania, distributed over almost all the Albanian territory:

*Quercus ilex* L., *Q. coccifera* L., *Q. calliprinos* *Q. frainetto* Ten. (Hungarian oak), *Q. cerris* L. (Turkey oak), *Q. pubescens* Wild, *Q. virgiliana* Ten., *Q. petraea* Mattuschka (Lieb) (chestnut oak), and *Q. dalechampii* Ten (Mitrushi, 1955; Paparisto, 1989).

Oak forests represent an important natural forests resources, not only because they occupy a large area, 336.800 ha, i.e. 31%, but also because they represent an important source of timber, providing 19% of the total. Oak forests are also valued for the high nutritive value of their leaves and acorns for cattle, especially during the winter.

The multiple uses of oak forests and the deforestation caused by clearing land for agriculture have caused their massive degradation, the reduction of biodiversity and severe soil erosion. Oak forests in Albania are managed in two ways: high forests and coppice. The shrub layer is characterized by *Pistacia lentiscus* L., *Buxus sempervirens* L., *Arbutus unedo* L., *Phillyrea latifolia* L., and *Erica arborea* L.. The herbaceous layer includes L., *Viola alba* Besser, *Rubia peregrina* L. and *Asparagus acutifolius* L. In the past, *Q. ilex* was widely distributed in the Mediterranean belt.

Today it is very rare because of over cutting and is classified as an endangered species (Red Book, 1995). It is important, therefore, to include this species in protected areas and approve measures for its development and protection. *Quercus macrolepis* Kotschy forms important forests in Albania, up to 800-900 m above sea level, mainly in Southern Albania. It is found in pure and mixed forests. These forests colonize deep alluvial soils, with a humid and warm microclimate.

- **Beech forests**

Beech (*Fagus sylvatica*) is a common tree species in Albania. Beech forests occur at 800 to 1.600 m elevation in northern Albania, from 1.000 to 1.800 m in the middle part of the country and from 1.200 to 1.900 m in the southeastern part of the country. In terms of area, the beech forests in Albania are the second largest. Beech forests are more diffused in the north and southeast, but small areas are founded even in the middle of the Albania. Beech forests are not diffused in the southern mountains of Albania because of dry winds and arid land. Only exception is a small area on the Nemercka Mountain. The Beech forests represent 18.6% of the total forests area in Albania. They are found in two important and large areas of Beech forests of Albania: the hill zone and the mountainous Mediterranean zone. They are the most important for wood production.

- **Mediterranean fir**

Fir (*Abies alba*) replaces beech forest in the southern part of the country, where it is found only in Bredhi i Sotires and Bredhi i Hotoves at elevations of 1.000 to 1.700 m.



Photo 22: Broad leaves forest. Source: E. Nuna, 2012



Photo 23: Mediterranean shrubs. Source: E. Nuna, 2012

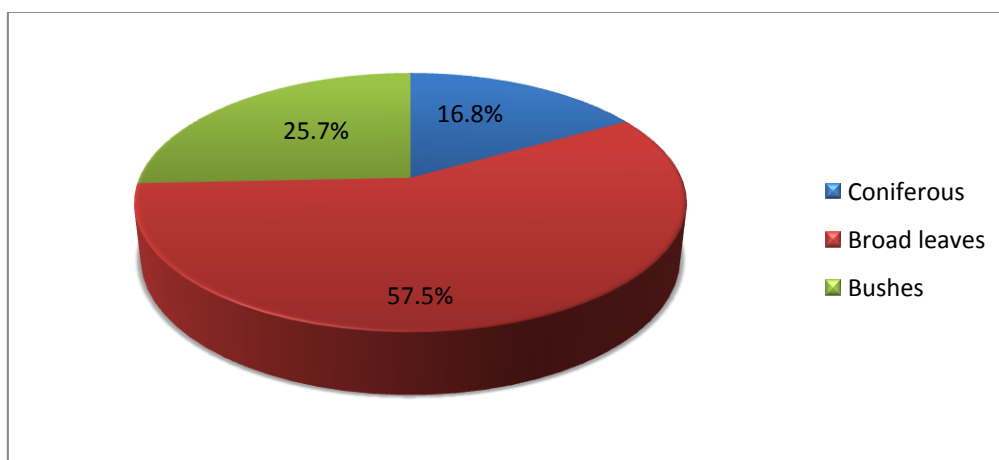


Photo 24: Broad leaves forest. Source: E. Nuna, 2011

The structure of the forests is given in the table below.

	Surface /ha	%
<b>A. CONIFEROUS</b>	176.07	16.8
Black Pine	109.84	10.5
Fir	16.73	1.5
Mediterranean Pine	34.98	3.3
Others	15.02	1.5
<b>B. BROAD LEAVES</b>	600.68	57.5
Beech	194.85	18.6
Oak	330.76	31.7
Popular	1.37	0.1
<b>C. BUSH-es</b>	267.89	25.7
Mare	59.44	5.7
Oak-hornbeam	92.17	8.8
Others	116.28	11.2
<b>Total</b>	1.044.640	100

Fig. 19 and 20: Structure of forests. Source: YPEF Albania



### Typical and exceptional fauna and flora species in forests

In the forest there are different species of trees and the most important are: beech (*Fagus sylvatica*), white fir (*Abies alba*), and (*Pinus heldreichii*, *Pinus picea*, *Quercus fraineto*, *Quercus petraea*, *Pinus nigra*) etc.

They are very important because from a healthy biodiversity provides a number of neutral services like:

**Ecosystem services:** protection for water resources; soil formation and protection; nutrient storage and recycling; pollution breakdown and absorption; contribution to climate stability; maintenance of ecosystems.

**Biological recourses:** Food; medical recourses; pharmacy drugs; wood products; population reservoirs; future recourses; diversity in genes, species and ecosystems.

**Social benefits:** Research; education and monitoring; recreation and tourisms, cultural values.

The most important non wood forest products in Albanian forests are medicinal plants, berries, mushrooms, herbs, seeds etc. Medicinal plants that are presents in these habitats are: Bilberry (*Vaccinium myrtillus*), *Rosa canina*, *Juniperus oxycedrus*, *Juniperus communis*, *Urtica dioica*, *Gentiana lutea*, *Salvia officinalis*, *Origanum vulgare*, *Colchicum automnale*, *Rubus ideaus*, *Valleriana officinalis*, *Rubus fruticosus*, *Hedera helix* etc.

In these areas are different species, endemic, sub-endemic or rare like *Wulfenia baldaccii*, *Gymnospermum scipetarum*, *Violoa kosanini*, etc.

Forest is home for the Balkan lynx sub species *Lynx lynx martinoii*, which is restricted to the southwest Balkan, in the border between Macedonia and Albania and Montenegro and Kosovo. The declination of the number of the individuals of this species is the best indicator that shows what happens if we don't care for the forests and their habitants.

In Albanian forests there are different animal species like Wild boar (*Sus crofa*), Roe deer (*Capreolus capreolus*), Chamois (*Rupicapra rupicapra*), Wild cat (*Felis sylvestris*), Brown bear (*Ursus arctos*), Red fox (*Vulpes vulpes*), Wolf (*Canis lupos*), Pine marten (*Martes martes*) etc.



Photos 25 and 26: Balkan Lynx (*Lynx lynx*) and Wild Cat (*Felis sylvestris*). Source: YPEF Albania

### Organization of Forestry

Forests fund in Albania is administered by state, commune and private administration. As is shown in the diagram forests under communal administration are more than state administration.

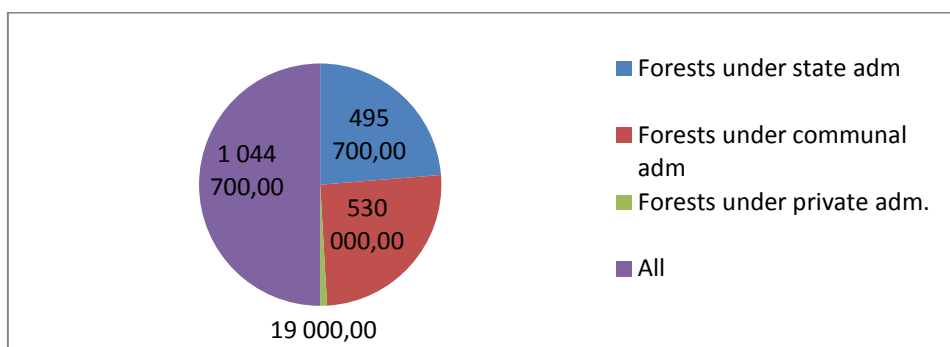


Fig. 21:  
Organization of forestry.  
Source: YPEF Albania

## Austria

### Forest characteristics and forest types

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



Austria's forests are today a cultivated landscape, the result of centuries of human care and attention. 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 65%, Protective function 31%, Beneficial function 3% and Recreational function 1%.

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. The total growing stock in Austrian forests is 1095 billion m<sup>3</sup> in Austrian forests and 1/3 of the annual increment is felled every year.



Photos 27-29: Forests in Austria.

Source: YPEF Austria

### Typical and exceptional fauna and flora species in forests

The distribution of tree species in percentages is the following: 54% Spruce, 2% Fir, 5% Larch, Pine 6%, other conifers 1%; 10% Red beech, 2% Oak, 10% other deciduous.

Austrian's forests are habitats for much typical middle European wildlife. Hunting has a long tradition. 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.

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

Forests cover about 47% of Austria's federal territory and are thus of great importance for the maintenance and enhancement of biodiversity. 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.



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](http://www.nationalparke.at)).



Photos 30-33: Impressions of Austria. Source: YPEF Austria

Nature parks, unlike national parks, are areas managed by man and smaller in size. ([www.naturparke.at](http://www.naturparke.at)). Biosphere reserves (parks) are natural landscapes which are of particular importance to humans.

**Organization of Forestry**

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.



Photos 34-35: Impressions of Austria. Source: YPEF Austria

- **Ownership status**

We have 80% Private forests, 15% Federal Austrian Forests (Österreichische Bundesforste AG) and 5% other public forests.

- **Forest Authorities**

All actions and activities of the forest authorities are based on the 1975 Forestry Act as amended.

## Belgium

Belgium is situated in the temperate oceanic zone (Lindner et al. 2010), the most important bioclimatic zone in northwestern Europe. Topography is characterized by lowlands, plains and hills but not mountains. Average daily temperatures in January and July are 1°C and 17°C respectively. The annual precipitation is about 750 mm in the north and more variable in the south, varying locally from 700 up to 1.500 mm.

### Forest characteristics and forest types

The total forest area is 672.200 ha, roughly 22% of the land area. Belgian forests are mainly young, very productive, and have a high C-sequestration capacity.

Forest is an essential element of Belgium, fulfilling 4 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 place for people seeking clean air and open space. Forest has something to offer to everyone: walkers, fishermen, hunters.
- Important for the landscape.





Photos 36-38: Forests and Foresters. Source: Belgium

- **Forest Certification**

Programme for the Endorsement of Forest Certification (PEFC) 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<sub>2</sub>**

Belgian forest stocks around 480 million tons of CO<sub>2</sub> equivalents (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<sub>2</sub> emission of 800.000 cars! However, the most important feature of wood in relation to CO<sub>2</sub> is in fact substitution. Wood used in construction, furnishing, etc. replaces other materials, such as PVC, concrete or aluminum, which demand far more energy for their production. The same applies for wood used for energy, which replaces fossil fuels.

### **Typical and exceptional fauna and flora species in forests**

Given the diversity of soil types (sand, silt, clay) and climates (from 0 to 700 m above sea level, from 700 to 1.500 mm of rainfall), many species have adapted to Belgium.

But because of the historically high degree of urbanization, ancient or undisturbed forests do not exist in Belgium. In 2000, the forest area mainly consisted of 60 year old stands (46%) and uneven-aged stands (46%), classified as semi-natural or plantation, and possessing low species diversity. The general young age of the forests is probably a result of the considerable efforts directed at afforestation after World War II, as well as the relatively short rotation times used for even-aged coniferous stands. Stands are mainly high forests (84%).

Distribution of tree species in the forests:

- **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%

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**

Today forest in Belgium accounts for 22% of the national territory distributed among 3 regions of the country:

- 79% in Wallonia, in the south of the country (more elevated and hilly topography in the south, 200–700 m a.s.l.);
- 21% in the Flemish Region, to the north (mainly lowlands below 200 m a.s.l.);
- 1% in the Brussels-Capital Region in the center.

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

The European Natura 2000 network covers 13% of the national territory. Integral or managed nature reserves are scattered across the country. In the Wallonia Region these reserves cover around 10.000 ha.



Photos 39-43: Forest impressions. Source: Belgium

### **Organization of Forestry**

Belgium is a largely urbanized country, but it has a significant forest area (22% of the land cover) that produces a gross value added of 2.12 billion euros or 0.8% of the gross domestic product.

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

Disturbances in the forest are caused by extreme climatic events, directly (e.g. storms) or indirectly (e.g. insect outbreaks after a mild autumn with an early/severe frost).

- **Owners and managers**

- **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 characterized by a relatively high level of parceling 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.

- **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 Centers and Church Councils (3%).

## Cyprus

### Forest characteristics and forest types

- **Area**

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

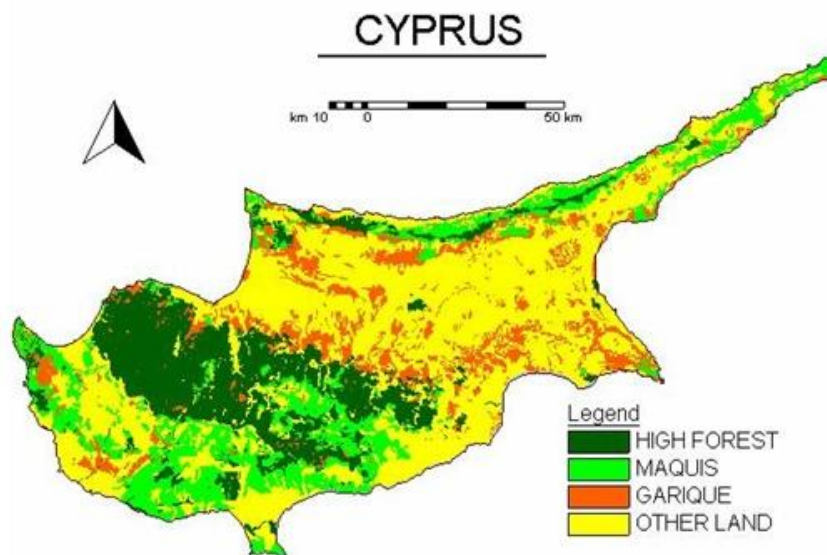


Fig. 22: Vegetation map of Cyprus. Source: Natural resource information and remote sensing centre, 1998

- **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**

- **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**

- **Biodiversity**



Photos 44-45: Reptiles. Source: Cyprus

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. Up of 1.780 vascular plants found in Cyprus, 145 are endemics.



Photos 46-47: Endemic cedar and Endemic tulip. Source: Cyprus

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



Photos 48-49: Vulture (*Gyps fulvus*) and Endemic mouflon. Source: Cyprus

In Cyprus we can find various flora and fauna species such as: 28 mammal species, 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 3.500 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

- **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.



Photos 50 and 51: Calabrian pine stand and Kavo Greko National Park. Source: Cyprus

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.

**Maquis:** cover 13.6% of the land.

**Phryghana:** 9.4 % of the land is covered by phrygana (Garigue).

- **Benefits**

The major outputs from forests are wood products and non-market services and influences. Wood products (about 10.000 m<sup>3</sup> 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**

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".



Photos 52-53: Botanical garden and typical picnic site. Source: Cyprus

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.

- **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



Photos 54-55: Fire brake and Fire look –out tower. Source: Cyprus

- **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



Photos 56-57: Group of fire fighters and Helicopter in action. Source: Cyprus

○ **Suppression**

These measures include:

- Fire Fighting Squad
- Fire Duty Roster of Forest Officials
- Organization of Forestry Works
- Fire Engines
- Air means
- Fire fighting tools



Photos 58-59:  
Forest Fires.  
Source: Cyprus

## Czech Republic

### Forest characteristics and forest types

Forests in the Czech Republic cover an area of about 1/3 of the country and the amount of woodlands has been increasing as a result of excess of newly cultivated areas over those taken away. The vast majority of forest is situated in areas which are not suitable for intense agriculture activity.

The Czech Republic belongs to the group of smaller countries in Europe, although it has a large amount of natural resources including a diverse and rich forest bioceonosis. The variedness of habitats and the geographic position of the country, which is situated at the cross of several phytogeographic areas, have caused the creation of wide range of floral communities.

The forests are mainly gymnosperms /needle-bearing (3/4) with the predominant spruce (*Picea abies*) representing 51% of the population. Another coniferous trees are pine (*Pinus sylvestris*, 17%), larch (*Larix decidua*) and fir (*Abies alba*). The main group of broad – leaf trees (1/4) are beech (*Fagus sylvatica*), oak (*Quercus*) and birch (*Betula*).

The ratio/number of broad-leaf trees has risen since 1950 from 12.5% to 25%. The ratio/share of regenerated amount of broad-leaf trees is about 40% at the moment. It is caused by the financial support of EU programmes which contribute to the increase of stability and biodiversity. It is apparent that the change in species composition in favour of more resistant trees is going to continue even in future.





Photos 60-62: Spruce bark beetle. Source: VULHM archive.



Photo 63: Forest damage caused by Spruce bark beetle.  
Source: Stanislav Janský.

In the Czech Republic three main categories of forests with different approaches are determined:

1. Agro forests, Productive forests (3/4): the main purpose of the forests is the production of wood.
2. Protective forests (2.5%): forest at extremely unfavourable stands, on its existential borders and also forests occurred close to the upper border of a tree line. Their main task is to protect soil from erosion and ground movement and the lower agro forests.
3. Special purpose forests (1/4): forests in national parks or national reservations, forests around natural spring resources of mineral waters or along protected water ways. In this category there are also forests with sub-productive - soil protective function, e.g. smaller areas of woodland in cities, urban forests, school forests dedicated to education and research and forests in protective areas.

### Typical and exceptional fauna and flora species in forests

Species composition and distribution of Czech forests altered in the past in an effort to increase the great demand for some tree species. 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.



Photos 64-66: Red deer and  
Roe deer. Source:  
[www.mezistromy.cz](http://www.mezistromy.cz)

- **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.



Photos 66-68: Sitka deer, Wild boar and Hare. Source: [www.mezistromy.cz](http://www.mezistromy.cz)

- **Exceptional fauna**

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



Photos 69-70: Capercaillie = Wood grouse (*Tetrao urogallus L.*) and Heathcock = Black grouse (*Lyrurus tetrix L.*)  
Source: [www.mezistromy.cz](http://www.mezistromy.cz)

- **Typical flora**

- **Acidic soil sites**



Photo 71: Pine stand with blueberry (*Vaccinium myrtillus L.*). Source: UHUL Plzeň archive.

Photo 72: Blueberry (*Vaccinium myrtillus L.*). Source: [www.mezistromy.cz](http://www.mezistromy.cz)

○ Fertile sites



Photo 73: Woodruff (*Galium odoratum*) .  
Source: www.mezistromy.cz

### Organization of Forestry

- **Forest Management Legislation**

The main valid rule is the Forest Act. It defines law and obligations of forest owners and forest visitors, prohibits certain inconvenient behaviour such as making fire, camping, using motor vehicles, making noise, disturbance of soil or bike rides off the marked routes. It obligates the forest owners maintaining 50 ha of land to have the forest management plan made – i.e. estimated economic activities in 10 years plan. The preservation of the Czech forest for future generations, the increase of competitiveness in the Czech countryside, the increase of biodiversity of forest ecosystems and support the importance of education, research and innovations in forest economy belong to the main long-term aims of the Czech forest policy.

- **Ownership Structure**

The largest percentage of forest (60%) belongs to the state., i.e. the state company Forests of the Czech Republic, Military Forests and Farms and National Parks Authorities. Private forests are present about 23% and 17% belong to municipalities. The law that guarantees the restitution of forest lands to the Church has passed recently. The estimated ratio part of returned forests is about 5%.

- **Social Situation in Forestry**

The number of employees and entrepreneurs in forestry has been declining for a long time. The creation of new labour in the country and areas with high unemployment has become an important social aspect recently. The average salary in forestry is about 5% lower than in other branches of the economy. In general the wood processing industry is employing about 200 thousand people at the moment.

- **Game Management**

Game management has been a part of forest management. Game management has a rich history and complex structure. The smallest hunting ground is defined by law. Statutory rules define the determined number of game as well as the number of hunting dogs used in particular hunting grounds.

In spite of the existence of this sophisticated system, the overpopulation of deer and wild boar still occurs. According to the hunt the widespread species are: wild boar, roe deer, red deer, fallow deer, moufflon and game birds like pheasant and wild duck.

## Estonia

### Forest characteristics and forest types

Estonia is located in northern 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 meters above sea level. Estonia's highest point is 318 meters.

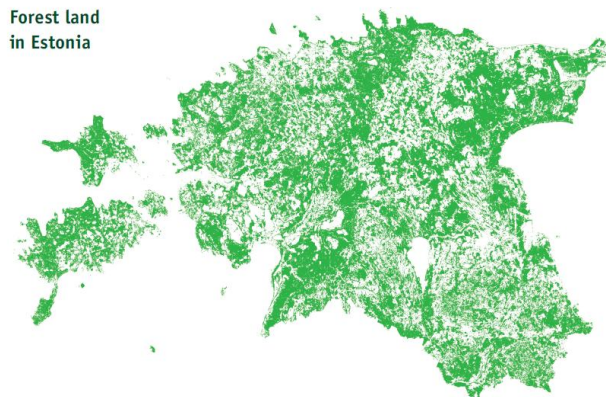


Fig. 23: Forests cover more than 50% of Estonia's territory.  
Source: YPEF Estonia

The climate varies from maritime to continental. Average annual precipitation increases from west to east within a range of 600–700 mm. Average temperatures in July and February are 17°C and 5°C, respectively. 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, 45.000 km<sup>2</sup>, 26 forest types can be distinguished.



Photo 74: Bogs cover ~5% of Estonia.  
Source: YPEF Estonia

For the past thousand years forests have strongly been influenced by human. Forest covered 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 to year 1939, the total forest area has increased by more than 50%. The annual increase is on average 12.000 hectares. The growing stock volume is 455 million m<sup>3</sup>.

The Baltic region, including Estonia, can be considered as a transitional zone between intensively managed Western Europe and old-growth forest rich North-Eastern Russia. Estonian forests play an essential role in economy, as well as maintaining the ecological balance and carrying out social functions. Forestry is one of the most important branches of Estonia’s economy. Wood and wood products are almost the only articles in Estonia’s foreign trade balance which have positive balance.

**Typical and exceptional fauna and flora species in forests**

• **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.

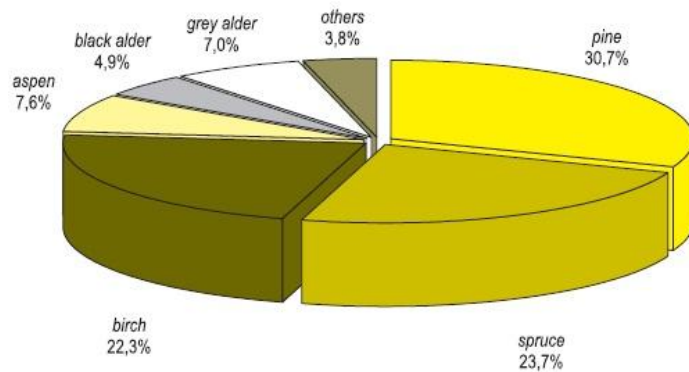


Fig. 24: Distribution of growing stock by tree species. Source: YPEF Estonia

• **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, which aims 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.

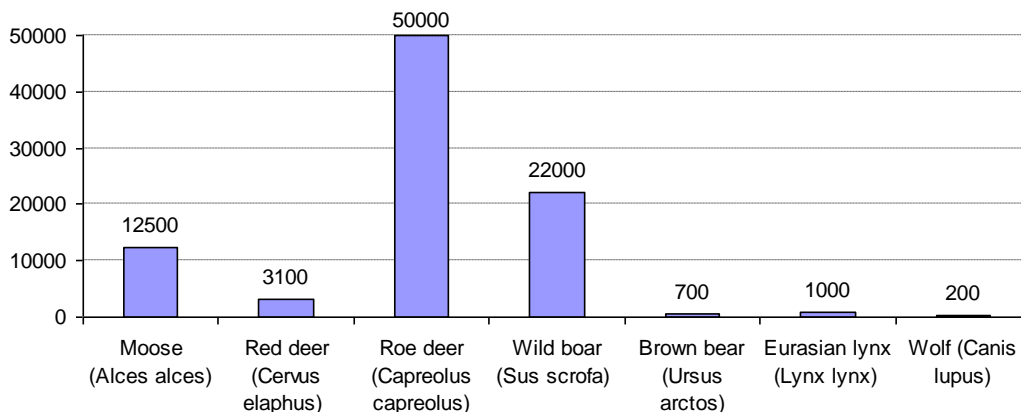


Fig. 25: Big game species. Source: YPEF Estonia

Example of endangered species: European mink (*Mustela lutreola*) is listed by the IUCN as Critically Endangered species due to continuous reduction, which is 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.



Photo 75: European Mink.  
Source: YPEF Estonia

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

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 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 1/4 of Estonia is covered with different protection areas. Among these, about 10% are strictly protected areas.



Fig. 26 Natura 2000 areas. YPEF Estonia

### **Organization of Forestry**

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 nationalized 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 75% of Estonian forests are managed. Forest act on forest management is very strict.

For example a forest must be restored within 5 years after clear-cuts and there is a minimum cutting age for tree species (for Scots pine it's 90 years). This ensures sustainability in forestry.

Forests are important for timber production, nature conservation and recreation. For every Estonian there is 1.7 ha of forest. One 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.

## **Finland**

### **Forest characteristics and forest types**

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. 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.



Photo 76: Finnish forest and water landscape.  
Source: Metla/Erkki Oksanen.

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, and parish). The Finnish State owns 29%.

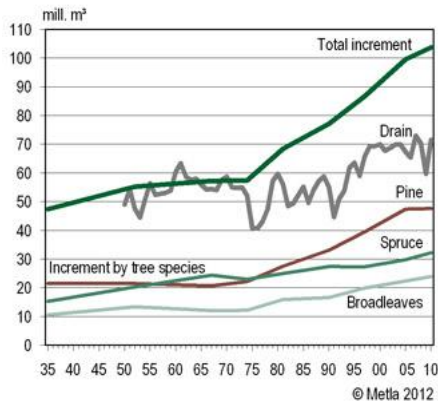


Fig. 27: Annual increment of growing stock (1935–2010) and annual drain (1950–2010). Sources: Finnish Forest Research Institute (Metla), National Forest Inventory and Forest Statistics Information Service.

The growing stock volume in Finland amounts to 2.284 million m<sup>3</sup>. The average increment of growing stock in Finland is about 5 m<sup>3</sup>/ha/year. The annual increment of the growing stock in Finland is over 103 million m<sup>3</sup>. Half of the growing stock consists of Scots pine, 30% of Norway spruce, and 20% of broadleaved species (mainly birch).

Forest is Finland’s most significant renewable natural resource. Finland’s forests are managed in a sustainable way, 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.

### Typical and Exceptional fauna and flora species in forests

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 4 coniferous tree species native to Finland, and fewer than 30 deciduous trees and arborescent shrubs. The majority of forests in Finland are coniferous forests, with broadleaved species often growing in mixed stands. 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.



Photos 77-78: Finnish birch forest and Moose (*Alces alces*). Source: 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 waterfowl. 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**

The establishment of statutory conservation areas in Finland has been based on conservation programs for national parks, strict nature reserves, mires, waterfowl habitats, eskers, herb-rich forests, shorelines and old-growth. The first national parks and nature reserves in Finland were established in 1938.

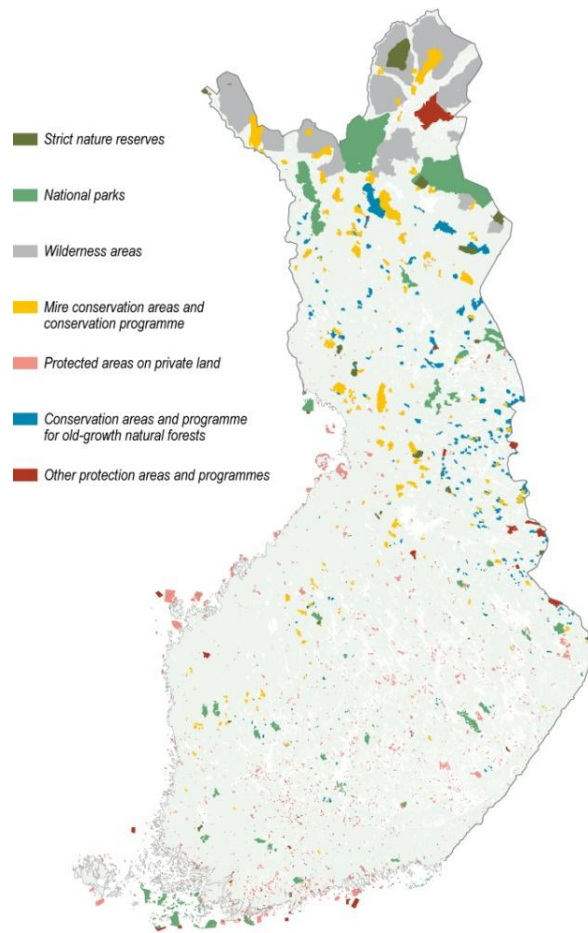


Photo 79 (up left): The natural characteristics of habitats of special importance, such as this spring, which must be preserved during silvicultural works and wood cuttings. Source: Metla/Erkki Oksanen  
Photo 80 (down left): Deadwood is left in the forests in wood cuttings. Deadwood helps the survival of certain species (e.g. woodpeckers) on the site across tree generations. Source: Metla/Erkki Oksanen  
Photo 81 (right): Nature conservation areas in Finland. Source: Metla/Finnish Statistical Yearbook of Forestry, 2011.

Share of strictly protected forests in Finland is 5.2% of forests. This accounts for over 13% of Finland's total forest area. The majority of protected forests are in northern Finland. Due to many protection programs and decisions, protected forests have increased three-fold in Finland over the past 30 years.

The EU Natura 2000 network in Finland includes 1.860 protected sites, 3/4 of which are terrestrial areas. The majority, 97%, are nature conservation areas established under national decisions. These areas can also be part of national conservation programs or be protected in other ways.

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**

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 82 (left): Precommercial thinning in Finland. Photo: Metla/Erkki Oksanen.

Picture 83 (middle): Collecting mushrooms and berries for private consumption is common in Finland.

Picture 84 (right): Wooden construction. Metla House in Joensuu, Finland. Source: 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, 3/4 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.

## Germany

### **Forest characteristics and forest types**

Germany is dominated by the temperate zone. Geographically Germany is divided into northern German lowlands, low mountain range, foothills of the Alps with the Alps. These conditions cause a natural diverse forest structure in Germany. The originally forest vegetation is the deciduous forest and mixed forest with coniferous forests in mountain regions. Forests increased by approx. 1 million hectares (10%) in Germany over the past four decades.



Photo 85: An overview 10 km north east from Berlin. Source: Stephanie Gotza

The amount of forest area is about 11 Million ha (approximately 1/3 of the total area of Germany). One third of the forest area is coniferous trees and two thirds are hardwood trees.

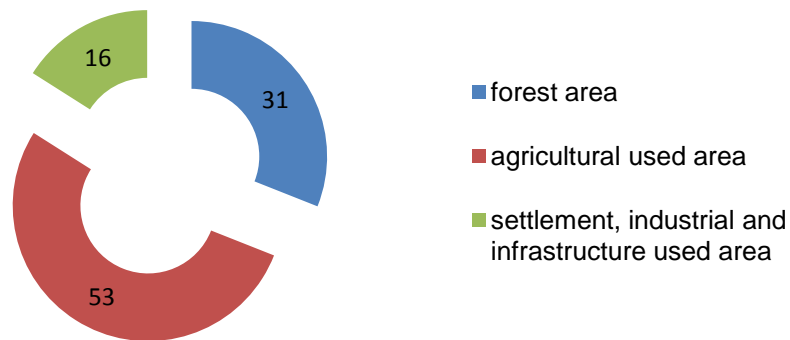


Fig. 28: Amount of Forest Area in Germany in %. Source: Holzabsatzfonds, 2006

Today's distribution of forests, farmed agricultural areas, traffic spaces and settlement areas in Germany is the result of human interventions over many centuries. The remaining forests are no longer primeval forests, but production forests shaped by humans. As a potentially natural vegetation form, beech forest communities would prevail in German forests and cover 2/3 of the forest area (BMELV.de, 2011).



Photo 87: Typical picture of a coniferous forest.  
Source: Stephanie Gotza

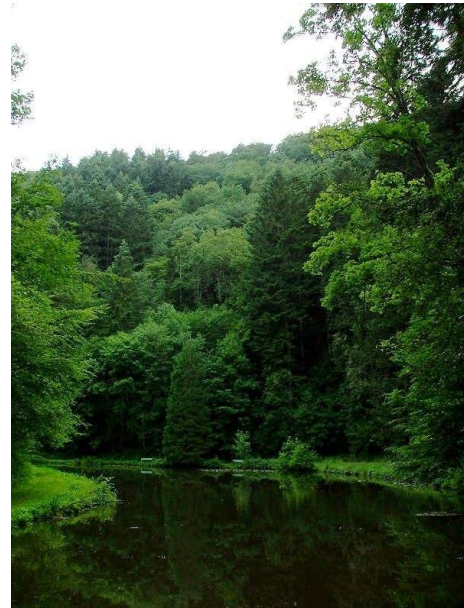


Photo 88: Typical picture of hardwood.  
Source: Stephanie Gotza

Generally the today forest area in Germany can be divided into:

1. the rich pine north of Germany
2. the rich hardwood low mountain range of Germany
3. the rich spruce south of Germany
4. the coast area in Germany.

The forests in Germany have been managed according to the principle of sustainability for 300 years. The principle of sustainability is anchored in the Federal Law on Forests.

The German Hans Carl von Carlowitz was the founder of the principle of sustainability. In his book "Sylvicultura oeconomica" from 1713 he presented the assumption that food harvest should be in direct balance of growing. That means that you can harvest as much as can grow back.

Sie finden Nachhaltigkeit modern?

Wir auch – seit 300 Jahren.

FORSTWIRTSCHAFT IN DEUTSCHLAND  
Vorausschauend aus Tradition

Germany ranks among the densely wooded countries in Europe. This is largely a result of the efforts to rebuild high-yielding and ecologically valuable forests after the destruction of large forest tracts over the past centuries and, more recently, after the clear-cuttings due to both World Wars (BMELV.de, 2011).



Photo 89: Leaving deadwood in the forest. Source: Astrid Schilling

### Typical and exceptional fauna and flora species in forests

Today you can find about 70 types of trees in Germany. The main types of trees are pine (*Pinus sylvestris*), spruce (*Picea abies*), beech (*Fagus sylvatica*) and oak (*Quercus ssp.*).

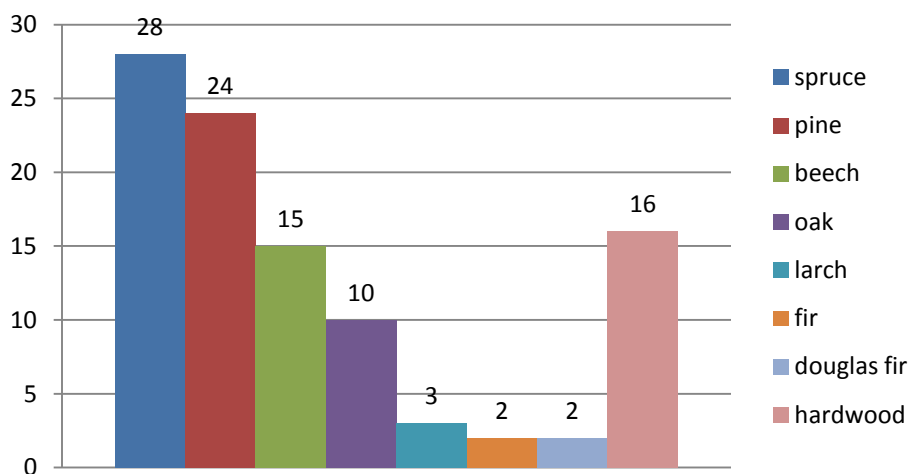


Fig. 29: Distribution of the tree species in Germany in %. Source: Holzabsatzfonds, 2006

## YPEF Educational material 2015

The forestry in Germany works since 30 years after the principle “close to nature forest management”. Therefore the structure of the German forests changes. Step by step rich coniferous sites were and will be transformed into mixed hardwood sites.

But what is the future of the German forests? The Global Warming, especially the annual average rise of the temperatures, will influence the forest ecosystems too. In 100 years there will grow more hardwood than coniferous trees.

The incidence of rare flora and fauna is also fostered by targeted measures or omissions such as:

- the establishment, tending and conservation of close to-nature forest edges,
- leaving deadwood in forests,
- the conservation and upkeep of special biotopes in forests, e.g. wetlands, heathland and xeric grassland,
- the protection of certain species such as red ants, bats, birds or orchids.

To lift out the value of the tree in the society, a Tree of the Year (BAUM DES JAHRES) is presented in Germany. Every year numerous activities take place all around the Tree of the Year, e.g. special educational programs for children and trade conferences for interested people and Tree planting actions.



Photo 90: Planting a tree.  
Source: Astrid Schilling

Mammals, who are living today in the German hardwood forest, are Martens, Fallow Deers, Red Deers, Boars, Lynxes, Foxes, Beavers and Otters. Since 1998 Wolves were detected in the eastern part of Germany. At the moment about 150 Wolves live in Germany.

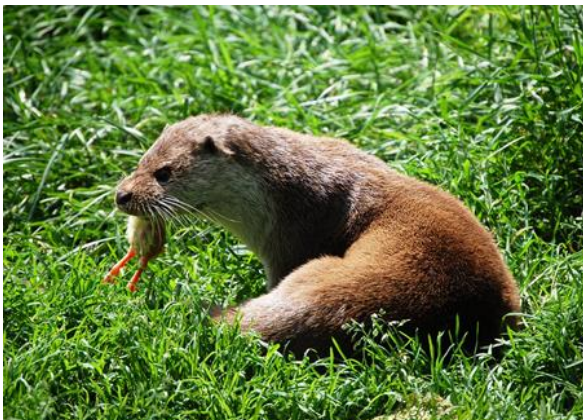


Photo 91: Otter in the Schorfheide, Germany.  
Source: A. Schilling

### Forms of Nature protection

The National Park “Bayerischer Wald” was founded in 1970 as the first national park in Germany. Today we have 14 national parks in exciting landscapes in Germany (see figure below). The land area of all parks amounts ca. 0.5% of the territory of Germany.



Fig. 30: National Parks in Germany (green areas). Source: Lencer, 2008. Source : ([http://www.bfn.de/0308\\_nlp.html](http://www.bfn.de/0308_nlp.html))

Today nearly 8.500 nature reserves exist in Germany. They take about 4% of the surface of Germany. The sign for a nature reserve (Naturschutzgebiet) is a black owl on a yellow background.



In Germany Natura 2000 became legally binding in 1998. Germany has reported so far 4.620 FFH areas, which cover three bio geographical regions (Alpine, Atlantic and Continental).

### Organization of Forestry

The Federal Law on Forests and the Law of Forests of the states guarantee the sustainable ecological, economic and social performance of the forests. The German forest area is divided into state forest (34%), community forest (20%) and private forest (46%).

## YPEF Educational material 2015

In 2012 the annual logging in Germany has been greater than 50 million m<sup>3</sup> (without bark). The per capita consumption of wood amounts 1.3 m<sup>3</sup>.

In most of the Federal states the state forest is divided in regional forest offices. The forest offices consist of individual forest districts with a size of 1.500 to 3.000 hectares. The forest districts are managed by foresters. The main tasks of the forest offices are the management of the property as well as the management of the forests under economic aspects. These tasks include the production of wood as well as harvesting and marketing of wood and non-wood products. On the same area they have to guarantee the protection and recreational function of the forest. Forest education is one of the central tasks of a German forester.



Photo 92: Young foresters in Eberswalde, Germany.  
Source: Astrid Schilling

The forest- and timber industry, including processing and paper as well as printing and publishing, comprise nearly 1.3 million jobs. Most of the people are organised in various professional and interest groups, like BDF (Union of German foresters) or SDW (German Association for the Protection of Forests). The SDW was founded in 1947 and is the oldest citizens' initiative in Germany.

In Germany there are four Universities, where you can study Forest Sciences. At five Universities of Applied Sciences you can study Forestry; there the education is more practice-oriented.



Photo 93: Old Forest academy in Eberswalde, today HNE Eberswalde (University of Applied Sciences). Source: Astrid Schilling

In Germany, anybody can enter forests for recreational purposes at anytime and anywhere. It is a right to which citizens are entitled, but also commits them to act responsibly towards the forest owner, nature and other people who take a rest in forests. Forest and nature conservation legislation contains restrictions and requirements for forest visitors, e.g. ban on access to certain areas, ban on smoking and open fire and straying from roads, keeping dogs on a lead and the protection of trees, timber and forestry or hunting facilities (BMELV.de, 2011).



## Greece

### Forest characteristics and forest types

Greece is located at the southern edge of the Balkan Peninsula. The country's topography is mostly mountainous. The tallest mountain is Olympus (2.918 m).

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.

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.*



Photos 94-95: Forests in Greece. Source: YPEF Greece

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, the geographical position of the country among 3 continents and the historical, economic and social changes.

The following vegetation zones can be distinguished:

**Mediterranean evergreen forest.** At low altitudes, there exist evergreen broadleaved species like *Olea europaea*, *Arbutus sp.*, *Quercus coccifera*, *Quercus ilex* and *Erica sp.*.

Forests of *Pinus halepensis*, *Pinus brutia*, are found in patches in the coastal lowlands. The forests are rather open, and have a shrub layer of evergreen species.



Photos 96-97: Forests in Greece. Source: YPEF Greece

**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* and *Arbutus unedo*. Macchie also is composed of some deciduous shrubs.

**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”.

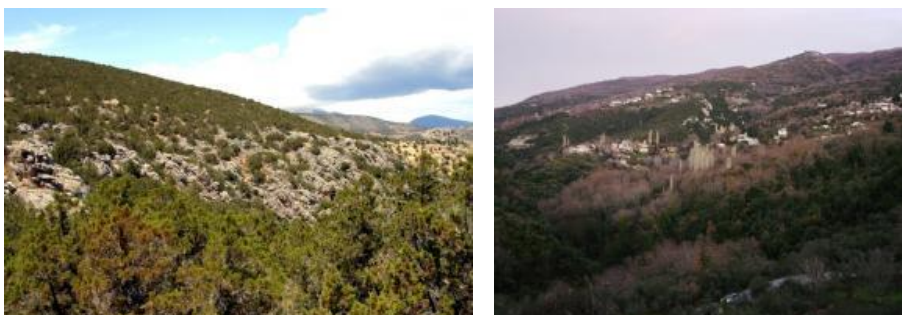


Photos 98-99: Impressions of Greece. Source: YPEF Greece

**Deciduous forest.** *Quercus pubescens* and *Q. frainetto* are the most widespread species of deciduous oaks generally occurring in the hills and lower mountain slopes in the more continental parts of the country. 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. *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 1.800m., 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*.



Photos 100-101: Impressions of Greece. Source: YPEF Greece

**Subalpine and alpine communities.** The timberline is generally formed by *Pinus* or *Abies*, in northern Greece and by *Cupressus* on Crete. Over 2.000-2.200 m high the areas are covered with species of low-growing shrubs.

**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* and *Nerium oleander* and at higher altitudes by *Salix sp.*, *Alnus glutinosa*, *Fraxinus angustifolia* and *Populus sp.*.



Photos 102-106: Impressions of Greece. Source: YPEF Greece

### Typical and exceptional fauna and flora species in forests

- **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.



Photos 107-110: Impressions of Greece. Source: YPEF Greece

• **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, many bird species most of which are migratory birds and a rich entomofauna.



Photos 111-113: Animals of Greece. Source: YPEF Greece

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

In Greece there are four forms of nature protection:

1. Ancient semi-natural forest types  
They include regions that were integrated into the European network of biogenetic reserves.
2. Strictly protected forest reserves  
This category includes National Parks, Aesthetic Forests and Wetlands.
3. Forest and woodland under a special management regime



This category includes Protected Natural Monuments, Controlled Shooting Areas, Game Breeding Stations and Wild Life Refuges.

4. Natura 2000 sites

Nowadays in Greece NATURA 2000 sites cover 22% of the total territory and they 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.



Photos 114-119: Impressions of Greece. Source: YPEF Greece

### **Organization of Forestry**

The contribution of the forest sector to the country's GDP is low. In Greece state forests account for 74%, whereas 26% are non-state forests.

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.

The main body for protecting and managing the country's state forests as well as for supervising the private forests, is the Forest Service.

## **Hungary**

### **Forest characteristics and forest types**

Hungary is situated in the middle of Europe, at the central and Western part of the Carpathian Basin. Hungary is mainly flat. Only 1/3 of the country has an altitude of over 200m 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. 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 only a small fraction.

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. 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 brush lands 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.



Photo 120: Vitality. Source: Pál Kovácsévics

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.

### Typical and exceptional fauna and flora species in forests

- **Flora**

**Beech** (*Fagus sylvatica*) forests are mainly located in mountains and in the lowest but colder and more precipitated Trans-Danubian regions. Today in Hungary, beech forests provide the largest wood volume per hectare and are also very important for the environment and nature protection.



Photos 121-123: Beech forests. Source: Pál Kovácsévics

**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. In their typical two-storey stands, hornbeams form the second canopy underneath sessile and pedunculate oaks.



Photo 124: Acorn. Source: Pál Kovácsévics



Photo 125: Hornbeam forest. Source: Géza Gelemen

Photo 126: Hornbeam-Oak forest. Source: Szabolcs Szabó.

**Turkey** (*Quercus cerris*) and **sessile oak** (*Quercus petraea*) forests are the most widespread associations, common in the mountains and hills. 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.



Photos 127-128: Turkey oak forests. Source: Pál Kovácsévics

**Loess-oak forests** (*Quercus robur*) 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.



Photo 129: Flowering acacia. Source: Péter



Photo 130: Acacia wood. Source: László Géza Greguss.

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.



Photo 131: Euramerican poplars with willows along the Danube. Source: László Géza Greguss.

- **Fauna**

Game stock is a vital part of forest biocenosis.

Large forests are the perfect habitat for red deer (*Cervus elaphus*), fallow deer (*Dama dama*), moufflon (*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. 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.



Photos 132-133: Fallow deer and Mouflon. Source: László Géza Greguss.

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

- **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, landscape protection areas, protected natural areas, and natural monuments. Nearly 10% of the national territory is under legal protection. Nature conservation is in many cases related to forestry. This is proved by the fact that the proportion of forests in the total protected area is more than 50%. Forest reserves are a unique nature protection category.



Photos 134-135: Puszta National Park Hortobágy and Water regulation in National Park Fertó-Hanság. Source: Pál Kovácsévics

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 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.



Photo 136: White poplar-juniper forest in National Park Kis-Kunság. Source: Pál Kovácsévics

- **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.

### **Organization of Forestry**

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 after the Second World War was hardly larger than 1 million hectares today exceeds 1.9 million ha.

In Hungary the share of state forests is 56%, 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. State forests are managed by 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.



Photos 137-138: Forest Fun Park and High Seat. Source: Pál Kovácsévics

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.

## Latvia

### Forest characteristics and forest types

The total area of the forest lands constitute more than a half of the territory of the state. Latvia is the fourth country in Europe (after the Finland, Sweden and Slovenia) with the largest proportion of land area covered by forests and other wooded lands.

In Latvia, forests are comparatively natural systems. Most of them are naturally regenerated forests however with clearly visible indications of human activities. In the context of forest growing conditions approximately half of the forests of Latvia are located on dry mineral soils. However a comparatively large proportion of forests lay also on drained soils. The forests on wet mineral soils take only small part the total forest area, as well as forests on wet peat soils.

The forests of Latvia are dominated by three tree species – Scots pine, Norway spruce and birch species (silver and downy birch). The remaining forest areas are occupied by stands of black alder, grey alder, aspen, ash and oak, and other tree species. The coniferous stands in general occupy almost half of the total forest area, but stands of deciduous trees – other half.



Photos 139-142: Forests in Latvia. Sources: Aigars Jansons and Raimond Putniņš, LSFRI „Silava“.

### Typical and exceptional fauna and flora species in forests

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

The rare and especially protected species in the forests of Latvia are brown bear, dormouse, northern birch mouse and several species of flitter-mouse. A protected species is also otter. From reptiles, the very rare and especially protected species are smooth snake and swamp turtle. The diversity of bird species in the forests of Latvia is very large. The very rare and endangered species are spotted eagle, red and black kite, eagle-owl, roller and green woodpecker. The rare and protected tree species in Latvia is common yew, which occurs mostly along the coastline. A protected species is also common hornbeam.



Photos 143-144: Forests in Latvia. Source: Raimond Putninš, LSFRI

#### **Forms of nature protection such as national parks and Nature 2000 sites**

In order to protect and maintain biodiversity of nature, in Latvia there are 684 specially protected natural areas approved by law or regulations of the Cabinet of Ministers. The protected areas are classified as:

**Strict nature reserves.** Territories untouched by human activities or nearly natural, in which unhindered development of natural processes shall be ensured in order to protect and study rare or typical ecosystems and parts thereof. There are 4 strict nature reserves established in Latvia – Moricsala, Grīņi, Krustkalni and Teiči.

**National parks.** Broad areas which are characterised by outstanding nature formations of national significance, landscapes and cultural heritage landscapes untouched by human activities or nearly natural, a diversity of biotopes, abundance of cultural and historical monuments. Along with nature protection, scientific research, education and organization of leisure have an important role. There are 4 national parks in Latvia: Gauja National Park, Ķemeri National Park, Slītere National Park and Rāzna National Park.



Photos 145-146: Gauja NP and Ķemeri NP Latvia.

**Biosphere reserves.** Broad territories in which landscapes and ecosystems of international importance are located. The aim of these reserves is to ensure the preservation of natural diversity and to promote sustainable social and economic development of the territory. In 1997 North Vidzeme Biosphere Reserve was established in Latvia. It is included in the international network of biosphere reserves.

**Nature parks.** Territories that represent the natural, cultural and historical values in particular region, and are suitable for recreation, education and the instruction of society. There are 42 nature parks in Latvia, from which the most popular are Tērvetes Nature Park and Nature Park “Daugava’s Circles”.

**Protected landscape areas.** Territories remarkable for original and diverse landscapes and special beauty. The aim of these areas is to protect and preserve cultural environment and landscapes characteristic of Latvia in all their diversity, as well as to ensure the preservation of environment appropriate for recreation of society and tourism. There are 9 protected landscape areas in Latvia.

**Nature reserves.** Nature territories unaffected or slightly affected by human activity, which include habitats of specially protected wild plant and animal species, and protected biotopes. There are 259 nature reserves in Latvia.

**Nature monuments.** Separate, isolated natural formations: protected trees (secular trees, potential secular trees, rare trees of foreign species, specifically trees), dendrological plantings, avenues, geological and geomorphological nature monuments (detritions of rocks, secular stones, caves, springs, waterfalls), which have scientific, cultural and historical, aesthetic or ecological value. 206 geological and geomorphological nature monuments, 89 dendrological plantings and 60 avenues are protected in Latvia.



Photos 147-149: Forests in Latvia. Source: Raimond Putninš, LSFRI

### **Organization of forestry**

In Latvia, approximately half of the forests are owned by the state, but the others are owned by the private owners and enterprises, and local governments. The territories of the state forest property, where the main aim of management is nature protection – forests in the National parks and strict nature reserves, are managed by the institutions of the Ministry of Environmental protection and regional development. For its part, the state forest property, the main aim of management of which is to ensure the implementation of commercial interests, is managed by the Joint Stock Company “Latvijas valsts meži” (“Latvian State Forests” or LVM). LVM performs forest management over the whole rotation cycle, including the sales of timber.

Sustainable development in the forest sector is guaranteed by the Forest Law, which define norms related to the duties of forest owners when they manage their properties. The Forest Law also determine that natural persons have the right of access and free movement in a state or a local government forest, if normative acts do not limit it. Access and free movement of natural persons in other forests may be restricted by the owner or the lawful possessor of the forest.

## Lithuania

### Forest characteristics and forest types

Total land area of Lithuania is ~6.5 million hectares. Forests cover over 2 million hectares, or about 33% of the total area of Lithuania and gives 0.67 ha per capita (comparing with the nearest neighbors, this number is less than in Latvia, but higher than in Poland). During World War II Lithuanian forest were overexploited, it is estimated, that in 1948 forest coverage was less than 20% of total area. To fix this situation actions, such as a large scale afforestation started to be taken.

Coniferous tree species are prevailing in Lithuania. Pine and spruce stands amount to 56% of forests, whereas among deciduous species birch stands are prevailing. The highest volume of timber is recorded in pine, spruce and birch stands, and the highest annual increment is noted in aspen and black alder stands.

### Typical and exceptional fauna and flora species in forests

Natural and semi natural flora occupy one third of Lithuanian territory. There are 1795 flora species inventoried in Lithuania. Most flora species grow (713 species) in forests. More than 4000 species of fungus are founded in forests. There are 321 bird species, 213 of them bred or used to breed in Lithuania. The White Stork (*Ciconia ciconia*) 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 up the tradition of telling their children that storks bring babies. Stork Day is celebrated on March 25. Notably, Lithuania is a beneficial and important habitat for these birds: it has the highest known nesting density in the world.



Photo 150: Stelmuze Oak.  
Source: Mindaugas Maksvytis

Among trees there are exceptional trees in forests. Oak stands occupy 2% of forests areas in Lithuania. Oak is treated as a symbol of strength. Down the ages Oak was respectfully protected. The felling of old oaks was forbidden since 1420. Stelmuze Oak is the thickest and the oldest tree in Lithuania and one of the most aged oaks in whole Europe. Stelmuze Oak age is about 1.500 years, diameter is 3.5m, perimeter close to ground is 13m, and height is 23m. Just 8-9 men can to clasp in arms the stem of Stelmuze Oak.

The tallest tree in Lithuania is 46 m height 150 years of age larch in Degsne botanical reserve.

The largest animal in Lithuanian forests is European Bison (*Bison bonasus*). The reintroduction of European Bison started in 1969. There are more than 50 free ranging European Bisons nowadays.

Among game animals Roe Deer (*Capreolus capreolus*) predominate in Lithuanian forests and open countryside. One of the most popular game animals to hunt is Wild Boar (*Sus scrofa*), not just because of the taste of their meet, but also because they can cause a variety of damage. The most common complaint is rooting resulting in the destruction of crops and pastures.



Photo 151: *Sus scrofa*. Source: Mindaugas Maksvytis

Fallow deer (*Dama dama*) were brought to Lithuania in the 16-17th centuries. They were raised in enclosures and served as decoration for parks. Later on fallow deer disappeared. The present population was raised from fallow deer which were brought from former Czechoslovakia and Soviet Union in 1976-77.

Beaver (*Castor fiber*) are a keystone species helping support the ecosystem of which they are a part. They create wetlands which increase biodiversity and provide habitat for many rare species such as water voles (*Arvicola terrestris*), otters (*Lutra lutra*) and water shrews (*Neomys fodiens*). They were almost extincted at the beginning of 20th century, then the reacclimatization of beavers started, and as a result of which these animals became common on the whole territory of the country, bringing more and more damage to the forests, flooding farming land. A beaver family can fell as many as 300 trees in a single winter. The newest estimates of beaver abundance in Lithuania range from 100 000 to 150 000.

Huge areas of valuable old forests in Curonian Spit National Park are damaged by Great Cormorant (*Phalacrocorax carbo*). Cormorants makes damage on or even can kill the trees they nest in, as well as smaller trees, shrubs and other plants underneath nests. They do this by evacuating on the branches.





Photo 152: Dune of Vecekrug covered with mountain pines in the Curonian Spit.  
Source: Mindaugas Matsvytis

### **Forms of nature protection such as national parks and Nature 2000 sites**

By 1st January 2010, the national network of protected areas covered 1.020500 ha or 15.6% of the total Lithuanian territory. General system of protected areas is made up of the following:

**Protected areas of conservational priority** which protect unique or typical complexes and objects of natural and cultural landscape. Strict reserves (natural and cultural), reserves and objects of natural and cultural heritage are attributed to this category.

**Protected areas of ecological protection priority** which are singled out in order to escape a negative effect on protected complexes and objects of natural and cultural heritage or negative impact of anthropogenic objects on the environment. Zones of ecological protection are attributed to this category.

**Protected areas of recuperational protection** which are designated for restoration, augmentation and protection of natural resources and genetic plots are attributed to this category.

**Integrated protected areas** which include conservational, ecological protection, recuperational and economic zones according to the general programme for protection, management and use. National and regional parks and biosphere monitoring areas (biosphere reserves and biosphere polygons) are attributed to this category. At the beginning of 2010, the Natura 2000 network covered 810.000 ha or 12.4% of the country's territory. Natura 2000 in Lithuania nearly always overlaps with national designations (CDDA).



Photo 153: *Lobaria pulmonaria*. Red listed species.  
Source: Mindaugas Maksvytis

The Red Data Book of Lithuania serves as a legal document on which the protection of rare and endangered plant, fungi and animal species is based. The Red Data Book contains descriptions of 767 species of animals, plants, lichens and fungi. Capercaillie (*Tetrao urogallus*), European pond turtle (*Emys orbicularis*), Smooth Snake (*Coronella austriaca*), Green Woodpecker (*Picus viridis*), Tengmalm's Owl (*Aegolius funereus*) are just few examples of rare and endangered species which inhabits forest.

### **Organization of Forestry**

The Directorate General of State Forests under the Ministry of Environment performs functions of the institution implementing the rights and duties of the owner of 42 state forest enterprises. It co-ordinates and organizes regeneration, maintenance, protection of state forests assigned to state forest enterprises and the exploitation of forest resources, establishes mandatory quotas for forest regeneration, protection and management to forest enterprises, organizes a uniform state fire prevention and sanitary forest protection system.

The Forestry Department at the Ministry of Environment directly participates in the formation, organization and coordination of forest policy and strategy.

The State Forest Service is carrying out the implementation of state policy related to forest management. Among other functions, the State Forest Service performs also the state control of forest condition, use, reforestation, afforestation and protection as well as issues cutting permits to forest owners, administrators and users.



Photo 154: Warning sign on entrance to wood harvesting. Source: Mindaugas Maksvytis

- **Types of forests ownership**

In 1990, after the restoration of Lithuanian independence, the land reform started. Today there are three types of forest ownership in Lithuania. Almost half of forests (4.6%) are the forest of State importance and managed by State Forest Enterprises. The area of private forests was gradually increasing. In 2011 it reached 837.4 thousands of hectares, or 38.6% of the total forestland area. Rests of the forests are those reserved for restitution and other forests.

In 2011 there were more than 245 thousand of private forest owners, the average forest area per owner being 3.3 ha.

## Norway

### Forest characteristics and forest types

More than 50% of the country is mountainous and thus not appropriate for woody plants. Despite these conditions, forest cover in Norway accounts for 20% of the total area (37% of which is forest and the rest is woodland). Productive forests cover an area of 7.2 million of hectares. Among the conifers, Norway spruce (*Picea abies*) and Scots pine (*Pinus sylvestris* L.) are the dominant species; introduced Sitka spruce (*Picea sitchensis*) is of increased importance, whereas, among the broadleaved species, birch (*Betula*) and aspen (*Populus*) are the dominant species. Only Norway spruce and Scots pine, besides Sitka spruce on West coast, are economically important. Birch is valuable as fuel wood and is also used in the pulp and paper industry.



Photos 155-156: Lyngen and Torfowisko Borgefjellet. Source: Norway

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

In general, in Norway, there are four eco-regions as defined by WWF:

1. Scandinavian coastal coniferous forests
2. Scandinavian mountain 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

There are approximately 60.000 species of different life forms in. There are 2.800 species of vascular plants, 450 bird species and 90 mammal species. 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 (*Castor fiber*) even if in Norway it is not considered as endangered. There are also 90 bird's species on the list and 25 mammal's species. 285 species are listed as critically endangered in Norway, some of which are: gray wolf (*Canis lupus*) and arctic fox (*Vulpes lagopus*). The largest predator on the Norwegian mainland is brown bear (*Ursus arctos*), whereas the largest herbivore is common moose (*Alces alces*).

Some of the most exceptional species in Europe still exist in the country, like: musk-ox (*Ovibos moschatus*), wild reindeer (*Rangifer tarandus*), white-tailed sea eagle (*Haliaeetus albicilla*) and killer whales (*Orcinus orca*).



Photos 157-158: *Ovibos moschatus* and *Rangifer tarandus*. Source: Norway

Natural vegetation in Norway varies considerably. 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 is protected.

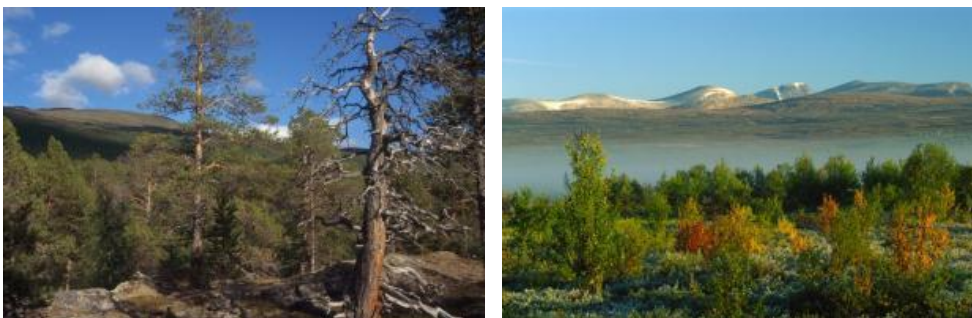
#### **Forms of nature protection such as national parks and Natura 2000 sites**

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% 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. However, the first national park (Rondane) was established only 50 years ago. Let's have a look at some of Norway's National Parks.



Photos 159-160: Ovre Dividalen and Fokstumyra. Source: Norway

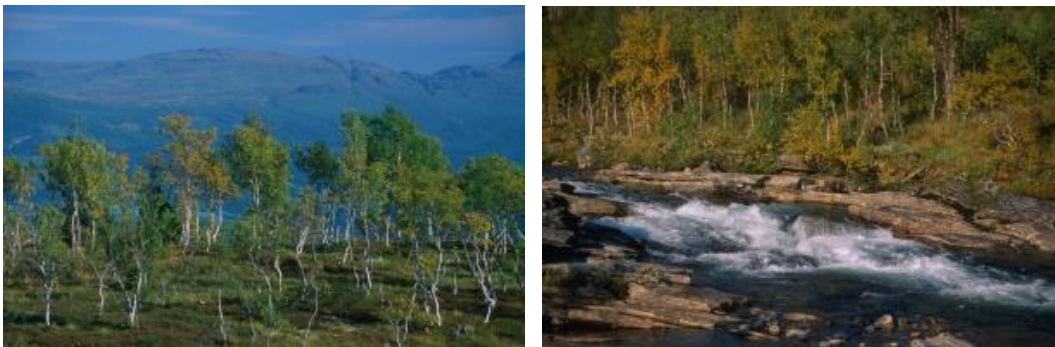
**Rondane National Park** is the oldest national park in Norway, established in 1962. In the park there are 10 peaks of more than 2000 m altitude. The park is an important habitat for herds of wild reindeer (*Rangifer tarandus*). The park was extended in 2003.

**Jotunheimen (“Home of the Giants”) National Park** is 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 1.900m, including Northern Europe's two highest peaks: Galdhøpiggen 2.469 meters and Glittertind at 2.465 meters. Glaciers have carved the hard gabbro rock massifs of the Jotunheimen, leaving numerous valleys and many peaks. Wildlife includes reindeer, elk (*Cervus canadensis*), wolverines (*G. gulo*) and lynx (*Lynx*).

**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. Several hundred 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.

**Jostedalbreen National Park** is a national park in Norway that has the largest glacier on the European mainland, Jostedalbreen. Within the Park there is the Famous Ice Museum (Bremuseum).

**Forlandet National Park** lies on the Norwegian archipelago of Svalbard. 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, the Forlandet and six others National Parks cover more than 60% of the island's area.



Photos 161-162: *Betula pubescens*. Source: Norway

### Organization of Forestry

The productive forest is divided into 125.000 forest properties. About 79% of the productive forest belongs to private owners. In Norwegian forestry forests can at the same time be used as agricultural land. In that case, the average size of the forest property is about 36 ha.

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.

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 (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.

Norwegian forests have been exploited intensively for export of round wood, 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. 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 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.

## Poland

### Forest characteristics and forest types

Nowadays forest area in Poland covers ca. 9 million hectares. (according to 2009 data from Central Statistical Office) which is 29.1% of the country's territory. There is a constant increase of the forest area. Regarding forests ownership, most of the forests are state-owned. State forests manage 77.8% of forests territory. Ownership status is presented below.



Fig. 31: Ownership status of forests in Poland (GUS)



Photo 163: Typical pine forest in Stare Masiewo surroundings. Coniferous forests cover 52.6% of the forested area in Poland.

Photo 164: Oak-hornbeam forest in Bialowieza National Park. Broadleaved forests cover 47.4% of the forested area in Poland. Source: YPEF

Pine dominates in lowlands, 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 clear-cutting forest management, which was very popular in the past. Clear-cutting involves removing mature stands in one cut (often in big areas) and establishing new stands artificially (by planting and rarely by sowing).

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.

**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.



Photos 165-167: Oak-hornbeam forests, riparian forests and alder forests are most interesting in respect of flora. Source: YPEF Poland

### Typical and exceptional fauna and flora species in forests

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 1.600 lichens. Among vascular plants we can find species from various geographical regions such as: Eurasia, North-American, Arctic, Middle-Europe, West-Europe, Black-Sea; even Mediterranean Sea.

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

Spruce (*Picea abies*) covers 5.5%, and is mainly found in north-east Poland and in highlands and mountains. Silver fir (*Abies alba*) is a significant species (2%). Its share in highlands and mountain forests is constantly increasing.

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

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

Alder (*Alnus sp.*) covers 4.4% of the forest and is mostly found in wet habitats - alder and riparian forests. Other broadleaved species, e.g. maple, sycamore maple, aspen, poplars, hornbeam and 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*

Photos 168-170: Plants of Poland. Source: YPEF Poland

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



Photos 171-172: *Salix lapponum* and *Saxifraga wahlenbergii*. Source: YPEF Poland



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. 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.



Photos 173-174: *Rupicapra rupicapra* and *Marmota marmota*. Source: YPEF Poland

- **Description of some fauna species**

**Exceptional species: Bison** (*Bison bosanus*). Nowadays in Poland there are more than 1000 individuals. Adult males weigh about 440-920kg, 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 178 000 individuals. Adult males weigh about 220kg. 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.



Photos 175-176: Bison and wolf – exceptional species of fauna in Polish forests  
Source: YPEF Poland

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

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

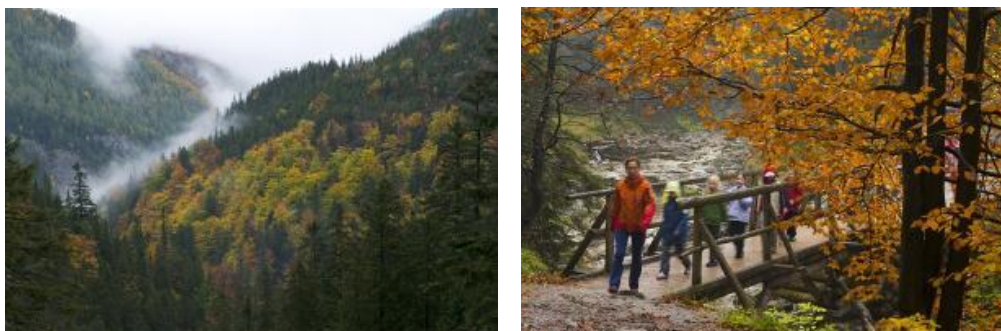
The most known Polish national parks are:

**Białowieża National Park** 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.



Photos 177-178: Strictly protected area in Białowieża National Park and Polish primitive horse. Source: YPEF Poland

**Tatra National Park** 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.



Photos 179-180: Forests in Tatra National Park and touristic path in mountains. Source: YPEF Poland

**Góry Stołowe National Park** 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.



Photos 181-182: Characteristic mountains with rock layers and the flat tip – “table mountains”.  
Source: YPEF Poland

**Biebrza National Park** 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.



Photos 183-184: Wetlands of Biebrza valley with a big moose population. Source: YPEF Poland

**Kampinoski National 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.



Photos 185-186: Sand dunes next to swamps near Warsaw (Kampinoski NP). Source: YPEF Poland

There are 23 National Parks in Poland. They cover a total of 300.000 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 one on the UNESCO list. By the end of 2008 in State Forests there were over 1200 reserves. In the forests there are also almost 11.000 nature monuments (trees or trees groups, alleys, rocks, caves).

Poland is a participant of NATURA 2000 – European Commission action. By the end of 2008 2.2 million ha Special Area of Conservation (SAC) were declared, what is 29% of State Forests area, and 1.1 million of Special Protection Areas for birds (SPA) was declared, what is 15.1% of forests.



Photo 187: On forest trails. Source: YPEF Poland

### **Organization of Forestry**

In Poland public forests dominates (81,8%), therein State Forests are 94%. Private forests, mainly persons, share 16.4 % of forests (1.6 million ha). Legal rules of forest management are based on “Forest Act” from 1991. Act is used for all forests irrespective of ownership form. Environmental Minister supervises State Forests while mayors of counties are responsible for the non – state forests.

State Forest National Holding (PGL LP) manages state forests. The PGL LP General Director supervises management, with help of employees of State Forest General Directorate and 17 Regional Directorates of State Forests.

Basic units in forest management system are forest inspectorates, managed by forest inspectors. Inspector, on the basis of forest management plan, makes the management decisions independently. In Poland there are 428 forest inspectorates.



Photo 188: When there is high fire risk, there is no entrance to the forest.  
Source: YPEF Poland

In Poland forests are commonly available; although limitations can involve sensitive areas, like forest nursery, research areas, animal territories, river springs. Limitation can be also periodic (e.g. due to fire, stand destruction).

Portugal

**Forest characteristics and forest types**

In a way, Portuguese forests are recent. In 1870, the total forest area was around 4 to 7%, and now represents 35,4%<sup>[1]</sup> of the continental territory. This increment was due to the migration of rural populations to the cities and to the higher demand of materials by the industry. That led to an increment of reforestation and fire vulnerability, since the forests no longer were cleaned to feed cattle and used as fuel resource<sup>[2]</sup>.

Portuguese forests are very diverse. The composition and their geographical distribution are determined by the gradient of water abundance/drought. As one goes from the more rainy North, to the drier south, or from coastline to inland, trees are more resistant to drought successively<sup>[2]</sup>.



Photos 188-190: Diversity of Portuguese forests. Source: YPEF Portugal

The main tree species are: Eucalyptus (*Eucalyptus globulus*), Maritime pine (*Pinus pinaster*), Cork oak (*Quercus suber*), Holm oak (*Quercus rotundifolia*), Stone pine (*Pinus pinea*), Oak (*Quercus spp.*), Sweet chestnut (*Castanea sativa*), other hardwoods and other softwoods<sup>[1]</sup>.

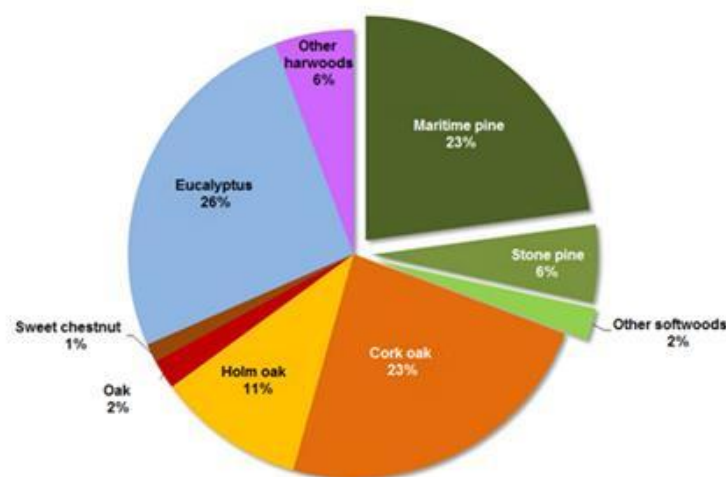


Fig. 32: Distribution of total areas by species/species group. Source: YPEF Portugal.

- **Maritime Pine forests**

*Pinus pinaster* is able to colonize poor or degraded soils. In the early XX century, it prevailed above the coastline where the timber and resin was used for pitch and tar production for shipbuilding and chemical industry. The expansion throughout the country was a result of the reforestation of abandoned agricultural land <sup>[2]</sup>.

Mostly, these forests are owned by small private forest owners that hold little forest area. This constrains the implementation of sustainable forest management, which can be translated into lower productivity and quality of wood and contributes to the increase of forest fire risk<sup>[2]</sup>. They are important for the rural areas economy, either for commercial purposes or for activities such as apiculture, pastoralism, game, mushroom production or resin tapping. Currently, these forests are decreasing due to forest fires and pests (ex. pine wood nematode)<sup>[3]</sup>.

- **Eucalyptus forests**

*Eucalyptus globulus* is a fast growing evergreen tree, exploited in plantations with production cycles of about 12 years<sup>[2]</sup>. The name globulus was given because its fruits seemed ancient Australian clothing buttons.

In Portugal, it prefers coastal and low altitude land (less than 700m), abundant rain and mild winters regions such as the coast north of Tejo river. The area of eucalyptus increased from 100 thousand hectares, in the 60s<sup>[2]</sup> to the actual 812 thousand hectares<sup>[1]</sup>. Its main use is the production of pulp and paper, but not only. Its flowers are



Photo 191: Eucalyptus stand.  
Source: YPEF Portugal

sought by bees for honey production and its leaves have a oil called cineol or eucalyptol, which has balsamic or antiseptic properties and that can be inhaled or used in sweets to combat the cold and bronchitis<sup>[4]</sup>.

- **Cork oak forests**

*Quercus suber* forests, called ‘Montados de Sobro’, are agro forestry semi-artificial ecosystems created by man, very important in terms of biodiversity and multifunctionality. Till 1950, cork oak forests increased as a result of an effort to restore an ancient system of land use and to respond to the growing demand for cork by the industry. In the recent past, afforestation of marginal agricultural land has led to an increase in the total area of cork oak in some regions, while in others there has been losses due to fires and changes in land use, despite this being greatly constrained by specific Portuguese law<sup>[2]</sup>. In Portugal this forests represent 34% of the world’s area, making the country the biggest cork producer<sup>[5]</sup>. In 2011, *Quercus suber* was officially declared national tree.

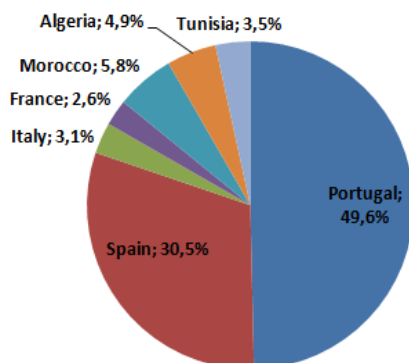


Fig. 33: Cork production.  
Source: YPEF Portugal



Photo 192: Cork bark stripping.  
Source: YPEF Portugal

- **Holm oak forests**

*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 *Alectoris spp*, *Sus scrofa* and *Cervus elaphus*<sup>[6]</sup>.



Photo 193: Holm oak forest.

- **Oaks forests**

In Portugal there are also other oak forests. Forests of native **Portuguese Oak** (*Quercus faginea*), known by 'Cercais', have amazing landscape and are extremely rich in biodiversity<sup>[7]</sup>.



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<sup>[8]</sup>.

Photo 194: Oak forest.

Source: YPEF Portugal

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<sup>[9]</sup>.



Photo 195: Stone Pine forest.

Source: YPEF Portugal

- **Stone Pine forests**

*Pinus pinea* forests are natural or artificial stands. They were traditionally used for wood, resin, and seed (pinion) production. Common along the Southern coast where we can find the highest percentage of contiguous stands (62% of the total area). In this area is produced 50% of the total pinecone<sup>[10]</sup>. The vegetation under forest cover, 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 and in the Natura 2000 Network<sup>[11]</sup>.



Photo 196: Sweet chestnut stand. Source: YPEF Portugal

- **Sweet Chestnut forests**

*Castanea sativa* forests used for timber production are called 'Castingais', while forests used for chestnut production are called 'Soutos'. These forests provide high quality wood (for carpentry, joinery and furniture) and also a large quantity of chestnut (for human consumption or animal breeding) contributing to the increased diversity in the composition and structure of forest stands. 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<sup>[12]</sup>.

- **Riparian forests**



Photo 197: Riparian forest. Source: YPEF Portugal

Riparian formations protect water streams and ensure water quality.

**Alluvial:** formations where deciduous species grow such as *Populus spp.*, *Salix spp.*, *Fraxinus spp.*, *Ulmus spp.* and *Alnus glutinosa*.

**Riparian:** formations where the species described above grow as well as species such as *Securinega tinctoria*, *Tamarix spp.* and, more rarely, the *Quercus pyrenaica* or *Corylus avellana*.

- **Laurissilva forests**

Laurissilva forests are classified as UNESCO World Heritage Sites. 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 are found in Portuguese archipelagos of Madeira (nearly 60% of the land) and in Azores<sup>[13]</sup>.

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

Fig. 34: Fauna of Portugal: Endemic species.

- **Flora**

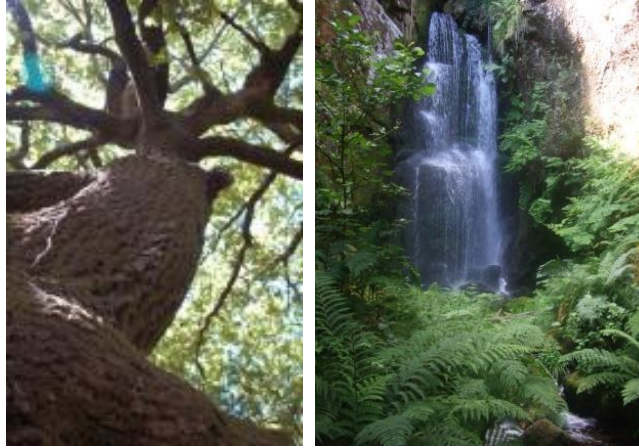
Indigenous tree species	Native shrub species
Portuguese oak ( <i>Quercus faginea</i> )	Strawberry-tree ( <i>Arbutus unedo</i> )
Monchique oak ( <i>Quercus canariensis</i> )	Portuguese crowberry ( <i>Corema album</i> )
Cork oak ( <i>Quercus suber</i> )	Prickly juniper ( <i>Juniperus oxycedrus</i> )
Holm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

Fig. 35: Indigenous tree species and Native shrubs species of Portugal.



### **Forms of nature protection such as national parks and Natura 2000 sites**

In Portugal, the Fundamental Network for Nature Conservation includes, among others, the National Network of Protected Areas and Natura 2000 Network. In December 2014, the total area under these two Networks accounted for 22% of the continental Portuguese territory<sup>[14]</sup>.



Photos 199-200: Typical portuguese nature. Source: YPEF Portugal

### **Natura 2000 sites**

In Portugal within Natura 2000 network there are 96 Sites of Community Interest, 59 Special Protection Areas<sup>[15]</sup>. In comparison with the other countries of the European Union, Portugal is above the average (about 15%). According to information from the European Commission, in 2011, only Spain, Bulgaria and Slovenia had a higher percentage of Sites of Community Interest than Portugal<sup>[16]</sup>.

### **National Network of Protected Areas**

These areas account for about 7.8% of Portugal territory, plus a marine surface<sup>[16]</sup>. Managed by the Public Forest Services, there are currently the following types: National Park (Peneda-Gerês National Park); Natural Parks; Natural Reserves; Protected Landscapes; Natural Monuments and Protected Areas. Azores has Protected Areas, Natural Parks and Madeira's Natural Park covers about 2/3 of the island. The Laurissilva is classified as a Biogenetic Reserve by the European Council and as a World Natural Heritage by UNESCO<sup>[17]</sup>.

### **Organization of Forestry**

Portugal is one of the European countries with the highest percentage of private forests (84%) only 2% is owned or managed by the State and 14% is community forests (common land). The private property structure has significant differences. North and Central regions the property is small and fragmented, while the South has large areas. Due to this and to the abandonment of the rural areas, private owners associations (POA) are a solution. They represent forest owners and managers and provide services such as counseling, technical support, forest management, group forest management, and also ensure the implementation of public programs. Currently, there are 177 registered associations in continental Portugal<sup>[18]</sup>.

In Portugal, public forests are protected and managed by the Institute for Nature Conservation and Forests (ICNF, I.P.).

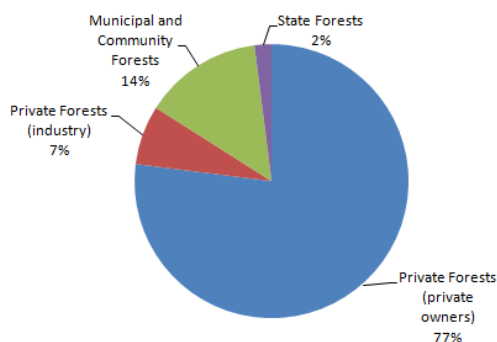


Fig. 36: Portuguese forest owners.  
Source: YPEF Portugal

- **Forest sector**

The forest sector is the third economic sector in Portugal. It is one of the pillars of the country's economic development, representing 2,5% of national Gross Domestic Product (GDP) and 3% of national employment and with the main advantage of being sustained by national resources. It is divided in three main forest sub-sectors that are specialized in the export of products and whose value represents, on average, 10% of the national exports.

- **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 to be used in unwinding or sheet, furniture and interior decoration, carpentry and joinery, sawing, grinding and firewood<sup>[3]</sup>. One of the by-products is bark which is used as organic matter to nurseries or fuel.

- **Sub-sector of Eucalyptus**

Currently, Portugal is the 4<sup>th</sup> largest European producer of paper pulp and the 11<sup>th</sup> in the production of paper and cardboard. The paper is the main product line in exports. Paper and pulp represent more than half of the total exports. Other industries such as civil construction and furniture also use eucalyptus wood<sup>[20]</sup>.

- **Sub-sector of Cork Oak**

Portugal is the country with the largest area of *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<sup>[7]</sup>. Almost the entire production (90%) is exported, making cork industry extremely important for the economy. Cork stoppers are the main products exported, followed by construction materials<sup>[5]</sup>.

- **Portuguese forests value**

The economic value of Portuguese forests (wood, cork, fruits and seeds, pastures, resin, honey, mushrooms and herbs, hunting, fishing, coastline, water protection 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<sup>[21]</sup>.

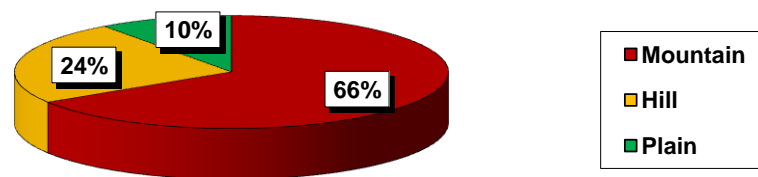
**Romania**

**Forest characteristics and forest types**

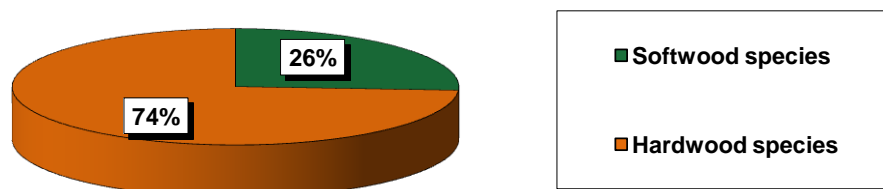
Romania is covered by rich and diverse vegetation, where forests account for about 27% of the national territory. From the top of the mountains to the seashore, one can find shrub and rocky vegetation, impressive coniferous forests, mixed spruce, primary fir and beech forests, meadows and ancient forests on 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 different climates coexist: continental, sub-Mediterranean and central European. Therefore, in Romania 5 geographic bioregions can be found (alpine, continental, pontic, panonian, stepic).

The wide variety of terrestrial shapes influences the climate to a large extent and support numerous local species or species common both for Europe and Asia.

The distribution of forests on various relief types is illustrated in the diagram bellow.



In the state forest area in Romania can be distinguished two main groups of species: softwood species and hardwood species, with the following distribution:



The most common softwood species in Romania is the Norway spruce. Within the hardwood species group, beech and oak are the most common species.



Photos 201-202: Beech and Norway spruce, the most common tree species in Romania.  
Source: YPEF Romania

Forest structure indicates the orientation of the Romanian forestry in applying seed-based regeneration of older stands in order to obtain diversified and uneven aged stands with high ecological stability and valuable industrial timber.

During the last century, forests have been 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 changes, 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.

### **Typical and exceptional fauna and flora species in Romanian forests**

Our forests have a rich diversity in terms of woody and herbaceous species providing a considerable stability of forest ecosystem and environment protection. The dominant part of the vegetation formations, identified at national level, are forest formations including species of zonal areas such as Norway spruce, fir, beech, durmast, Hungarian oak, Turkish oak as well as some species of intrazonal areas such as larch, black pine, ash, elm, native poplars and willows.

Among the natural forests of the Romanian Carpathians, some relict species which have survived the glacial ages are worth mentioning: *Syringajosikaea*, *Hepatica transsilvanica*, *Betula nana*, *Betulahumilis*, *Vacciniumoxycoccus*.

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



Photo 203: *Dianthus callizonus*. Source: YPEF Romania

The typical animals that can be found in the Romanian forests are: roebuck (*Capreolus capreolus*), red deer (*Cervus elaphus*), wild boar (*Sus scrofa*), fox (*Vulpes vulpes*), hare (*Lepus europaeus*). The fauna species of European interest that are found in Romania and which require a strict protection are: bear (*Ursus arctos*), about 40% of the European population, wolf (*Canis lupus*), about 30% of the European population, lynx (*Lynx lynx*), wild cat (*Felis sylvestris*), otter (*Lutra lutra*) etc.

In Romania there is a rich tradition of game species management, tradition developed and perfected by foresters. Carpathians, by their geographical position, the variety of landscape and rich hydrographic network, are an ideal habitat for maintaining viable populations of animals from different species and vigorous specimens. The presence of large carnivores (brown bear, wolf and lynx) is an element that favours the development process of natural selection and the emergence of exceptional trophies.



Photos 204-205: Wolf and bear, ones of the most important fauna species in Romanian forests. Source: YPEF Romania

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

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 which are typical of the temperate zone, as well as an important number of relict and rare species.

In order to preserve the biodiversity, Romania has created a network of protected areas designating natural protected areas of different types such as: National and Nature Parks

(some of them having world recognition: Biosphere Reserves or Ramsar sites) Scientific Reserves, Nature Reserves, Natura 2000 sites.

Protected areas provide critical ecosystem services that support human survival and prosperity. According to Millennium Ecosystem Assessment, the ecosystem services can be classified in:

- **Provisioning services** that relate to the tangible products, such as timber, non timber forest products, fish and pharmaceuticals products;
- **Regulating services** that refer to ecosystems natural processes such as carbon sequestration and water regulation which contribute to social wellbeing;
- **Cultural services** which relate to the non-material benefits obtained from ecosystems, for example, through tourism and educational use;
- **Supporting services** that are necessary for the production of all other ecosystem services (e.g. soil formation or nutrient cycling).

### The most important National and Nature Parks in Romania:

**Maramures Mountains Nature Park** is the largest nature park in Romania, which includes a zone of contiguous habitats in the northern side of the country. Restricted access due to the country border line and steep relief helped typical flora and fauna species of the Carpathians to survive. The area is considered to be a protected area created by nature. Houses, wooden churches and gates come to complete a landscape still untouched in the middle of the Carpathians.



Photo 206: Steam train on a narrow gauge railway (Mocănița). Source: YPEF Romania

**Piatra Craiului National Park** with the longest limestone ridge of Romania hosts the largest number of valleys and residual shapes such as: walls, belts, notches and hollows. *Dianthus callizonus* is an endemic species of the area, also referred to as the emblem of the mountain. Some of the big carnivores typical of this park are: brown bear, wolf and lynx. Chamois is also to be found at the upper belt of the mountain.



Photo 207: Piatra Craiului National Park. Source: YPEF Romania

**Vanatori Neamt Nature Park** is lying on the north-eastern side of the Romanian Carpathians, in the historic province of Moldavia, the Vanatori Neamt Nature Park is the only one in Romania which developed a programme for the bison reintroduction. That's the reason the Park is well known as the "Bison Land". It is known as a Sacred Natural Site, because of the presence of the famous Romanian Orthodox monasteries and hermitages. The living monastic communities represent the second largest Christian monastic community in Europe.



Photos 208-209: AgapiaVeche Convent and European Bison. Source: YPEF Romania

**Retezat National Park** is the oldest Romanian National Park, established in 1935. The Retezat famous treasures are found in the alpine zone, where there are numerous lakes. As for unique landscapes, the glacial cirques and valleys are breath taking 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.



Photos 210-211: "Slavei" glacial Lake and Chamois on Retezat's screens. Source: YPEF Romania

**Apuseni Nature Park** characteristics are the karstic landscape which exhibits a wide variety of shapes: cliffs, steep valleys, lapis, caves, underground waters.



Photos 212-213: Piatra Altarului Cave and Landscape in Apuseni Nature Park. Source: Apuseni Nature Park Administration

### **Organization of Forestry**

Nowadays, the forest ratio in the country is 27%, that is the 1/3 of the forest coverage in the far past. According to the forest legislation, forest coverage cannot decrease any further. In the context of the law of restitution to former owners, state forests decreased in 2013 at 49% of the total forest area.

State Forests are managed by the National Forest Administration - Romsilva, which is supervised by the Minister of Environment Waters and Forests.

The main activities of Romsilva are: forest regeneration and ecological rehabilitation, young stands tending, pest control, timber harvesting, production of timber and other wood products, exploitation of other forest products, wildlife management and hunting, management of natural protected areas, horse breeding etc.

Romsilva is divided into 41 regional forest directorates that are coordinated directly by the General Manager. Forest administrative units are the basic forest divisions and they are part of the forest districts. According to the Forest Law, forests are managed on forest



management plans basis and they are valid for 10 years. For poplar, willow and other fast growing species, forest management plans can be valid for a shorter period (5 years).

## **Slovak Republic**

### **Forest characteristics and forest types**

Forest area in Slovakia has been expanding throughout the years. Today, according to the National forest inventory data, the forest area accounts for nearly 45% 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). 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.



Photo 216: Share of Slovak forest is about 45 % from total land. Source: Vladimir Seben.

### **Typical and exceptional fauna and flora species in forests**

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 moufflon 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.

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. There are only a few wild herds of European bison in open air.

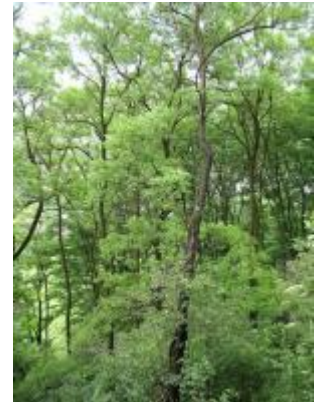
The main tree species which create altitudinal vegetation zones are: sessile oak, European beech, silver fir, Norway spruce and dwarf pine.



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



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)

Photos 217-223: Impressions of Slovakia. Source: Vladimir Seben

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

- **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 nearly 1/4 of the national territory. In Slovakia there are 9 National parks (NP): Tatra, Pieniny, Low Tatra, Slovak Paradise, Low Fatra, Muránska planina, Poloniny, High Fatra and Slovak karst, 14 protected landscape areas (PLA), and hundreds of 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 Sites of Community Interest (pSCIs) which account more than 1/10 of the Slovak territory. Nearly 90% of these sites are forest land.

**Organisation of Forestry**

Forests under state ownership more than 1/2 are managed by: Slovak Republic Forest Service, (majority), Forest-Agricultural Estate Service, Tatra National Park Authority. The above authorities belong to the Ministry of Agriculture of the Slovak Republic. Military Forests and Estates of the Slovak Republic belong to the Ministry of Defense of SR. Some state forests used by schools. 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 less than 172 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.



Photo 224: Forest: Source: Vladimír Seben

**Slovenia**

**Forest characteristics and forest types**

Slovenia is one of the European countries with the highest percentage of forest cover (58.4%). The forest ratio has been showing an increasing tendency in the last one and a half century. Most Slovenian forests are located within the area of beech, fir-beech and beech-oak sites, which have relatively high productivity.

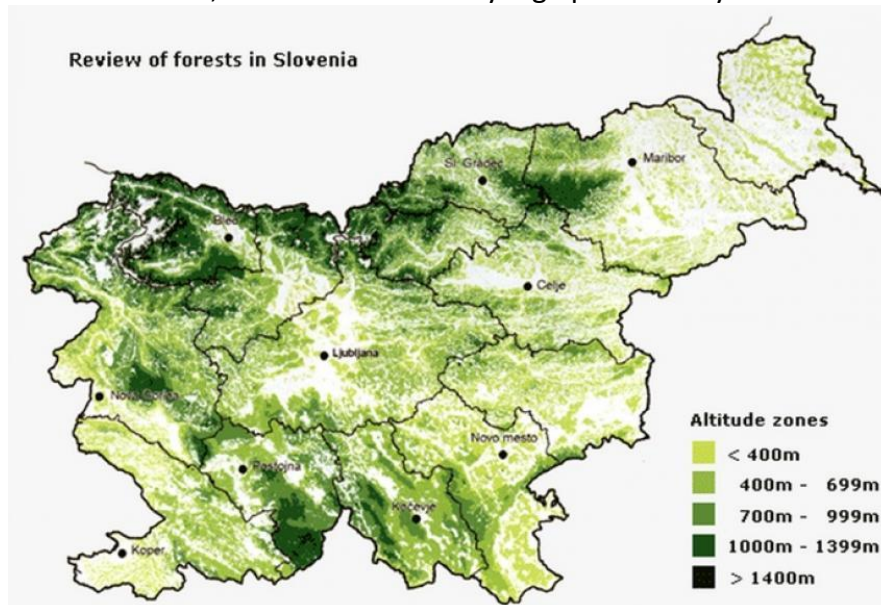


Fig. 40 Forests according to the altitude zones. Source: Slovenian Forest Service

- **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. The average area of private forests is small, which can be further fragmented into more plots due to the increasing number of forest owners, thus these forests are of no economic interest. 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.

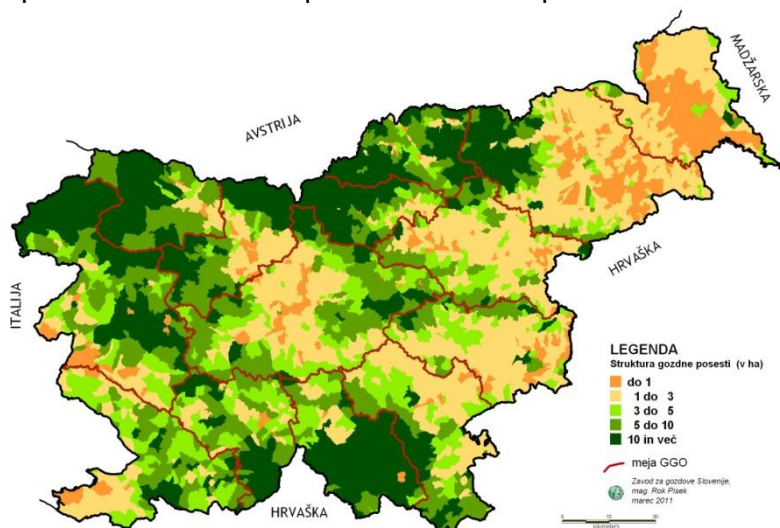


Fig. 41: Forest ownership status. Source: Slovenian Forest Service

### Typical and exceptional fauna and flora species in forests

- **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, fir-beech and beech-oak sites, with a relatively high productivity. Sites of thermophile deciduous trees and pines, covering only a smaller part of Slovenian forest area, have reduced timber production.

- **Nature favors broadleaves**

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, 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.

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.



Photos 225-226:  
Brown bear and Lynx.  
Source: Slovenia forest

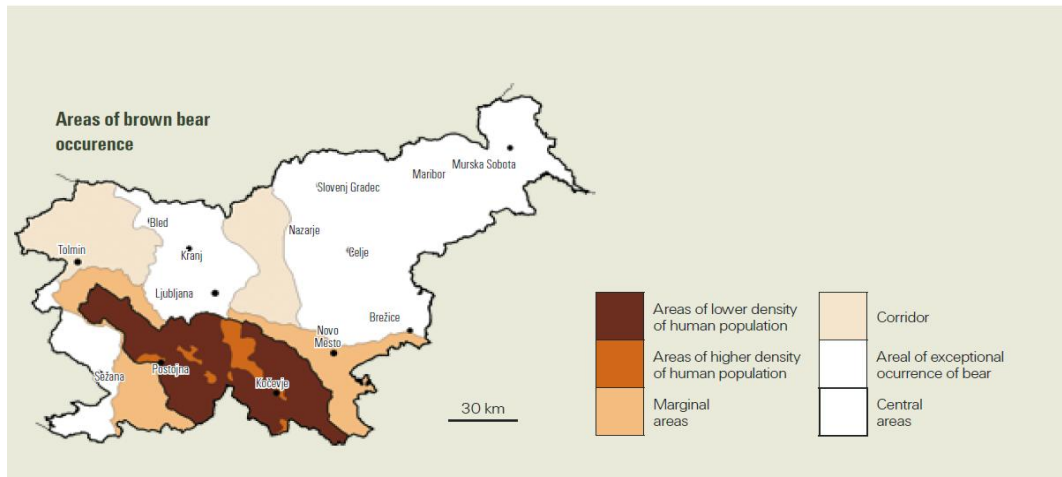


Fig. 42: Brown bear habitat. Source: Slovenia forest service

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

Such a relatively small country as 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 numerous 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:

- National park (IUCN: II/V)
- Regional parks (IUCN: V/II)
- Landscape parks (IUCN: V)

Small protected areas:

- Nature reserves (IUCN: IV and I)
- Natural monuments (IUCN: III)



Fig. 43: Protective forests. Source: Slovenia forest service

### Organization of Forestry

Slovenian Forest Service is divided into 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, which regulates protection, silviculture, exploitation and forest uses according to forest management plans;
- The National Forest Programme of the Republic of Slovenia, 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.



Fig. 44: Structure of Slovenia Forest Service. Source: Slovenia forest service



Fig. 45: Organization of Slovenia Forest Service. Source: Slovenia Forest Service

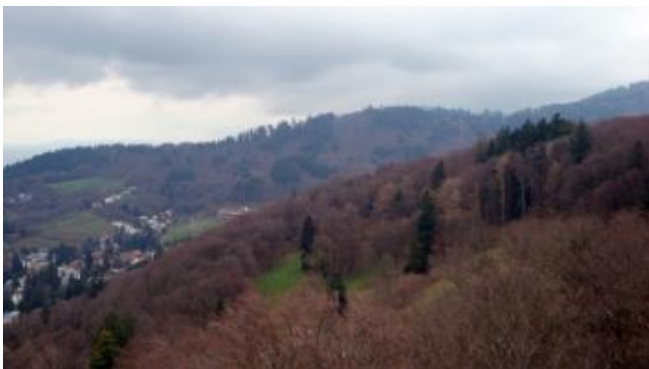
## Switzerland

### Forest characteristics and forest types

Forests are a central feature of our environment. People avail of the goods they produce, such as wood, and of the environmental services they provide, for example protection and recreation. As a renewable resource, forest must be harvested and managed sustainably: all its functions (ecological, economic and social) must be given due consideration.

Switzerland is a country in the western part of Europe, with a total area of 41.290 km<sup>2</sup>. It is one of the most mountainous 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 you can find a large amount 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 forests zone with a predominance of deciduous forests. Forests cover 33 % of the country, of which 13.9% are classified as being primary forests (172.000 ha). Since the nineteenth century, the area of afforestation has increased by 45%, during 1983-1985 the forests occupied approximately 1.180 thousand hectares, in 1993-94 the area increased to more or less 1.220 thousand hectares. Currently, the Swiss forest area takes up about 124.746 km<sup>2</sup>. 54% the Swiss Forests grow 1.000m over sea.



Photos 227-230: Forests in Switzerland. Source: YPEF Poland.



### Typical and exceptional fauna and flora species in forests

In Switzerland the flora and fauna is very diverse, with nearly half of the 40 thousand species of plants, animals and fungi living in forest ecosystems.

The largest share of the trees is taken up by beech and spruce, which constitute about 70% of the species composition of stands (67% *Fagus sylvatica*, 31% - *Picea abies*+*Abies alba*).

In Switzerland there are 513 species of amphibians, birds, mammals and reptiles, of which 2.5% are endangered. Due to the valuable and rare wealth of flora and fauna, 28.7 % of the country of Switzerland is protected (according to the International Union for the Conservation of Nature). About 20% of species of plants, animals and fungi in forest areas (6.000 species) are found living on dead wood. Swiss forests are rich in vascular plants; there are about 1.300 species, of which 8% is considered to be at risk of extinction.

One of the main challenges for the strategy of Swiss forests, is to maintain genetic diversity and to regenerate stands. In place of the eliminated fir stands, deciduous species are being introduced, and the plants used for afforestation are of native origin.

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

Examples of some of the different forms of nature protection in Switzerland:

The Swiss National Park is the only national park in Switzerland. It covers an area of 174.2 km<sup>2</sup> and was founded in 1914. It is situated in the area of the Rhaetian Alps and in 1979, was considered as a UNESCO Biosphere Reserve - Parc Suisse.



Photos 231-232: Biosphere reserves Entlebuch and Mustair. Source: YPEF Poland

### Organization of Forestry

Swiss forest stands can fascinate anyone with their diversity of species. They have a rich vertical structure, with most of the trees being mature stands with high thickness and width but also containing trees from the younger generation. The forest economy is based on 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 things it has to offer, but at the same time guaranteeing the correct development of multi – species stands. Anyone who loves nature will enjoy these forests, which by experts are said to have a through fell structure. This means that you can meet all the phases of development in these forests, from seedlings to old, mature trees. All of these different layers overlap to form a natural wall that isolates from the negative effect of external factors. These forests are very resistant to strong winds.



Photos 233-235: Forests in Switzerland. Source: YPEF Poland.

In Switzerland, there is about 5.000000m<sup>3</sup> of timber being produced, which represents approximately 70% of the annual growth.

Switzerland consumes around 10.5 million m<sup>3</sup> of wood annually:

Harvested timber is used for:

- energy production (including recovery) - 47%
- production of paper and paperboard - 28%
- production of furniture and other items from wood - 25%

Main functions of forests In Switzerland:

- manufacturing 40%
- protective (including soil and water) 40%
- reservoir of biodiversity 10%
- social 10%

Water is our most important basic foodstuff. Approximately 40% of Switzerland's drinking water originates from the forest. It is clean and inexpensive as it does not usually require additional treatment.

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

The ownership structure of Swiss forests:

- public 71%
- private 29%

Of which private ownership is as follows:

- individual ownership 87%
- businesses and institutions 13 %

Forests are also a place of recreation and a place of rest 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 significance 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.

The forests of Switzerland, because of their favourable climatic and geological conditions, are some of the most beautiful 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 to live a secure life in the valleys. The Swiss spend a lot of free time, during weekends and holiday periods, wandering through beautiful woodland areas. They can enjoy the forest without exposing it to destruction, fires and littering.

## Sweden

### Forest characteristics and forest types

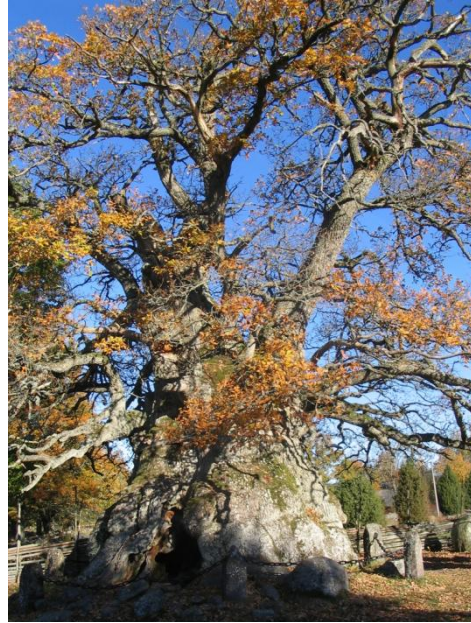
Sweden's total land area is 40.8 million hectares. Sweden's productive forests cover about 23 million hectares. Approximately 66% of the whole land area is covered with forests. Spruce and pine are by large the predominant species in Swedish forests. These two species count for more than 80% of the timber stock. In northern Sweden pine is the most common species, whereas spruce, mixed with some birch, dominates in southern Sweden. Forests of beech, ash, oak and elm trees cover less than one percent of Sweden.

There are 4.2 million hectares protected areas within National parks and Nature reserves. Total standing volume on productive forest land is about 2.9 billion m<sup>3</sup>, of which 39% is Scots pine, 42% Norway spruce and 12% birch. Average standing volume per hectare is 131 m<sup>3</sup>. The total standing volume of Swedish forests has increased by over 80% since the 1920s. The average annual productivity of forest land is 5.3 m<sup>3</sup> meters per hectare. Total annual growth is approx. 111 million cubic meters (productive forest) and approx. 117 million m<sup>3</sup> (all land use classes).

### Typical and exceptional fauna and flora species in forests

Sweden has a rich and varied wildlife. Brown bear (*Ursus arctos*), lynx (*Lynx lynx*), wolverine (*Gulo gulo*) and arctic fox (*Alopex lagopus*) can be met mainly in the northern part, while the wolf (*Canis lupus*) is expanding its habitat across northern and central Sweden. South of the country where the density of farmland are higher are liked by roe deer (*Capreolus capreolus*) and wild boar (*Sus scrofa*). Due to strictly regulated hunting brown bear and lynx populations are increasing.

Moose (elk, *Alces alces*) inhabit most of the Swedish forests and Sweden is believed to be the World's most densely populated country with Moose, so no other country has more Moose per square kilometer than Sweden. Throughout the country there are large numbers of red foxes (*Vulpes vulpes*), hares and rabbits as well. The moose is a great prize for hunters but is also a traffic hazard, causing ~ 4500 traffic accidents per year. Hunting is closely regulated, and many species of animals are completely protected.



Photos 236-237: Moose (*Alces alces*) juvenile and The Rumskalla oak near Norra Kvill National Park. Southern Sweden. Source: Mindaugas Maksvytis

Winter bird life in Sweden is dominated by a few species, but summer brings large numbers of migratory birds from the south.

Much of the Swedish landscape is dominated by coniferous forests such as pine and spruce, with large forests of deciduous trees such as birch and aspen in the south. Because of their limestone-rich bedrock and favorable climate, the islands of Gotland and Öland and parts of the Scandinavian mountain range have an interesting flora that includes numerous varieties of orchid. Orchids often have special habitat requirements, and many are therefore endangered as a result of environmental changes. All wild orchids have protected status throughout the country and may not be picked.

There are over 25.000 species of insects in Sweden, and 27 of them are protected throughout the country. Examples of species that may not be collected are the Parnassius Mnemosyne, the marsh fritillary, Apollo, the hermit beetle, the stag beetle and the dragon fly.

#### **Forms of nature protection such as national parks and Natura 2000 sites**

During the 18th and 19th centuries, many forests were overexploited for housing construction, fuel wood, charcoal for the iron industry and latterly as a source of logs for timber and pulping. Cattle grazed the forests at that time, reducing tree regeneration.

After decades of political debate, parliament passed the first Forestry Act into law in 1903. This required owners to replant after forest felling. The Forestry Act has been updated four times since then and today's comprehensive legislation balances relevant economic, ecological and social interests.

In 1910, Sweden became the first European country to establish national parks, mainly in the mountainous districts of Norrland. This helped save part of Europe's last wilderness from exploitation. Numerous nature reserves and cultural heritage areas have also been established across the country. There are 29 national parks in Sweden. Kosterhavets national park is the latest. Sweden also has three world heritages with high natural values. National parks and nature reserves together comprise 4.3 million hectares, which corresponds to roughly 10% of Sweden's total land area, of that amount; 795.000 hectares consist of legally protected productive forest land.

Additionally there are habitat protection areas and nature conservation agreements, mainly used in productive forest land. Voluntary conservation areas comprise another 1.1 million hectares in sub montane areas.



Photo 238: Kebnekais National Park, Northern Sweden. Source: Mindaugas Maksvytis

The environmental values of the forest are protected in several different ways.

**National Parks or nature reserves.** Sweden has some 3.200 nature reserves and their size may vary from a few hectares to thousands of hectares.

**Habitat protection.** Smaller habitats with plants and animals worthy of protection can be preserved through habitat protection.

**Nature conservation agreements.** High environmental values can also be protected through nature conservation agreements between forest-owners and the State.

**Voluntarily protected.** The forest land that is voluntarily protected can be documented in different ways, e.g., in a Green Forest management plan.

According to the Swedish Species Information Centre, there are 4.127 red listed species in Sweden, of which more than half are forest dwellers. The red list is updated every fifth year, most recently in 2010. Under the Right of Public Access, anyone is entitled to hike through forests and fields and pick berries and mushrooms, without asking the landowner's permission, but this right also carries with it an obligation to respect the natural environment and private property.

### **Organization of Forestry**

The Ministry of Rural Affairs is the ministry with responsibility for forestry. The Swedish Forest Agency is the national authority in charge of forest-related issues. The Swedish Forest Agency's main function is to promote the kind of management of Sweden's forests that enables the objectives of forest policy to be attained.

The Swedish Forest Agency (SFA), established 2006, replaced the County Forestry Boards and the National Board of Forestry. The agency is the overriding authority for forestry and associated environmental and conservation issues. It ensures observance of relevant laws and regulations, provides training, advice and information on forestry, and conducts forest surveys, to identify and maintain a register of valuable conservation and heritage sites. The regional forest agencies were merged with the Swedish Forest Agency in 2006.

The Swedish Environmental Protection Agency, under the Ministry of the Environment, is the national agency responsible for overall environmental policy, while other government agencies have specific responsibilities. It promotes environmental policy, acts as a unifying agent on environmental issues, and has national responsibility for nature reserve creation; the latter is coordinated with SFA. The two agencies employ legal measures, as well as education, training, advisory and information services, in ensuring adherence to national forest policy

- **Types of forests ownership**

Sweden has a diversity of forest owners. State manages relatively small public estate, the majority owned by Sveaskog - a state owned Forest Company. Private forest owner families hold about 50% of Swedish forests, privately owned forestry companies about 25% and the State and other public owners (Sveaskog, municipalities, church etc.) have the remaining 25%. The ownership of forests in Sweden varies between regions. In Southern parts of the country forests are mainly owned by private persons whereas in Northern Sweden companies own more significant amounts of forests.

There are 355.000 forest owners in Sweden and they supply about 60% of the timber used in industry.

- **Forest economics**

Forestry is central to the Swedish economy and most Swedes are closely related to forests and forestry pursuits so public access is also important. Sweden holds just below 1% of the world's commercial forest area, but provides 10% of the world's sawn timber, pulp and paper. Forestry's gross domestic product (GDP) contribution: 2.2%.

The Swedish approach to forestry is shaped by the country's natural conditions and constraints, its history, the knowledge and experience of the forest owners and the tradition of consensus policies based on mutual respect, understanding and compromise. Due to effective and far-sighted forest management the timber stock in Sweden has increased by more than 60% in the last one hundred years and it is now 3000 million m<sup>3</sup>. Growth has been most rapid in southern Sweden where forests in the early twentieth century were thin and in poor condition.

**Ukraine**

**Forest characteristics and forest types**

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 sanitary and hygienic, retaining water, environment protection and recreational. Furthermore, they satisfy the needs for forest products.

An average percentage of forest land in Ukraine is relatively low, that is 15.9 % of the overall area of the country. Over the past 50 years, the rate of afforestation has increased by 21% and growing stock by 3 times.

The forests of Ukraine are distributed very irregularly over the country, as a result of climatic conditions and anthropogenic influences over a long period of time. Forests grow in different zones: Polissia, Forest-steppe, Steppe, Ukrainian Carpathians and Crimean mountains.



Photos 239-240: Forests in Ukraine. Source: Ukraine

Forests in Ukraine are mainly of ecological importance and their high proportion (approximately 50%) with limited forest management regime. A percentage of reserved forests is high (15.6%) and it tends to increase.

Considerable quantity of forests grows in radioactive areas. The disaster 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. An average age of forests in Ukraine is over 55 years. Half forests of Ukraine are artificially created and require intensive care.

The growing stock is estimated at 2.1 billion m<sup>3</sup> and the average annual increment reaches 35 million m<sup>3</sup>. The gradual increase of growing stock in forests, confirms the considerable economic potential of Ukraine forests.

	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 %

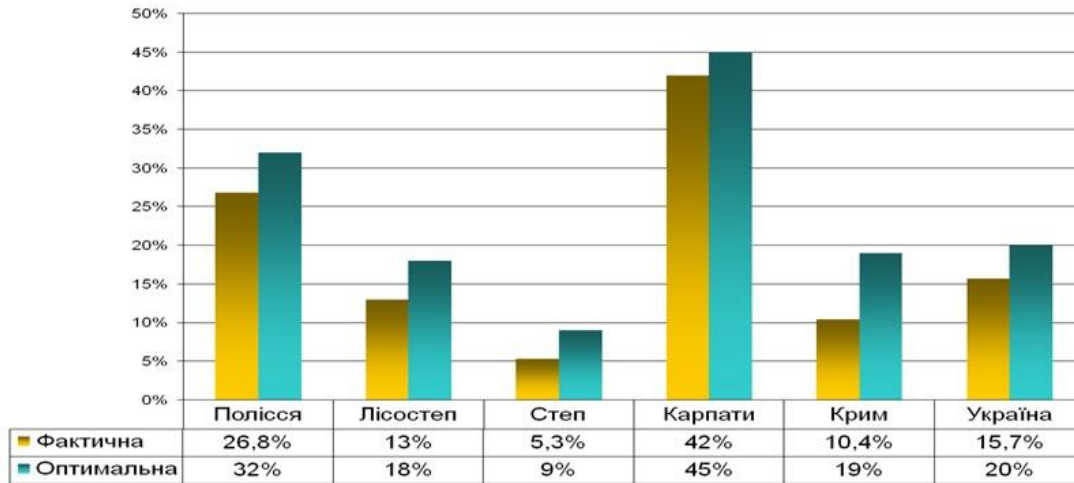


Fig. 46 and 47: Afforestation in Ukraine according to vegetation zones. Source: Ukraine

### Typical and exceptional fauna and flora species in forests

Forests in Ukraine are distributed unevenly. They are mostly found in Ukrainian Carpathians and also in Polissia region. The Transcarpatian region with is the most wooded region in Ukraine.

Flora of Ukrainian forests is very rich due to diversity of climate zones. Ukrainian forests include more than 30 tree species such as: pine (*Pinus sylvestris*), 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 lands cover 42%, deciduous - 43%, softwood broadleaves and shrubs – 15%.

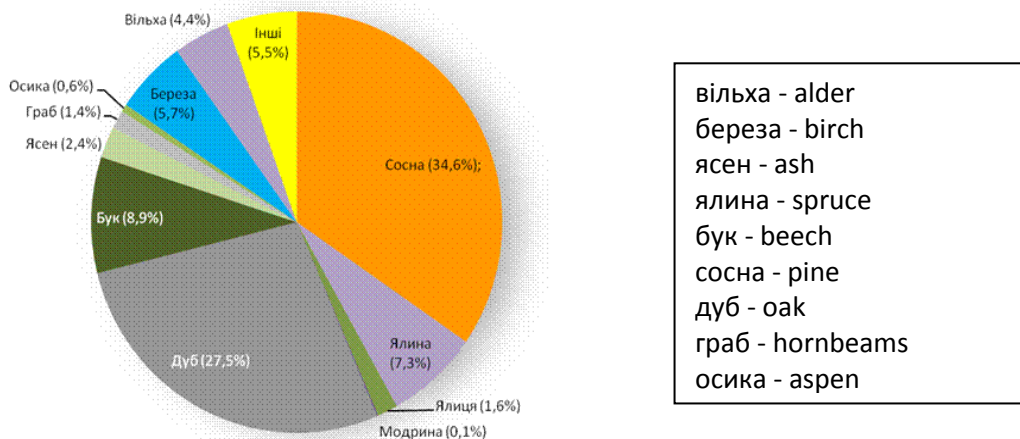


Fig. 51: Distribution of tree species in Ukraine. Source: Ukraine

- **Game fauna**

The most common game ungulates in forests are the following: European roe deer, wild boar, moose, red deer, spotted deer, fallow deer and moufflon. Game 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**

In 1994 Ukraine ratified the Convention on Biodiversity. Currently, the percentage of forests under protection on the territory of Ukraine is 5.9%. The State Agency of Forest Resources has approximately 35% of the natural protective state resources.

It should be noted that within 30 years the percentage of forest land under protection has increased by more than 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.



Photos 241-242: Forest rivers. Sources: Ukraine

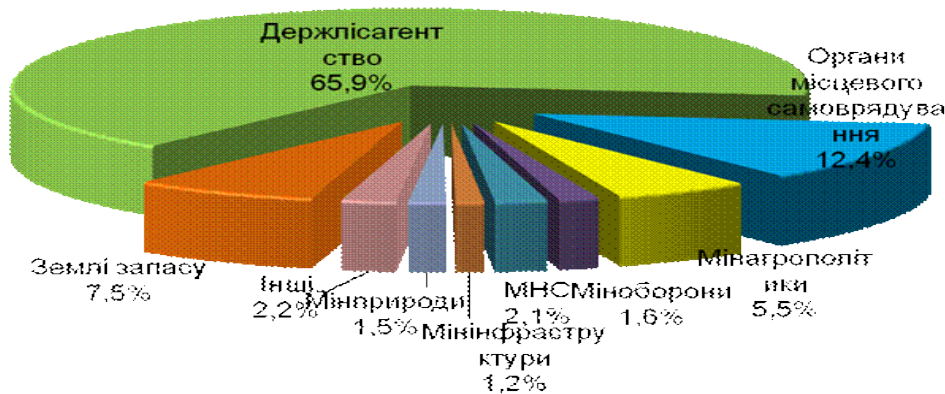
In addition, since 1961 the percentage of forest under protection has increased from 34% to 50%. In general, in Ukraine, production is not permitted in 40 % of the forests. There were established more than 3.1 thousand areas and monuments of natural protection, covering 1.2 million ha of forests belonging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



Photos 243-244:  
Ukraine flowers.  
Source: Ukraine

### Organization of Forestry

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 (66 %), Ministry of Agricultural Policy and Catering (5.5 %), Ministry of Defence (1.6%), Ministry of Emergency Situations (2.1%), Ministry of Ecology and Natural Resources (1.5%), Ministry of Infrastructure (1.2%), local governments (12.4%) other ministries and departments (2.2%), land belonging to the state (7.5%).



- 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
- Органи місцевого самоврядування – local governments
- інші – Other

Fig. 48: Distribution of forest resources of Ukraine according to departmental subordination.  
Source: Ukraine

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.

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