

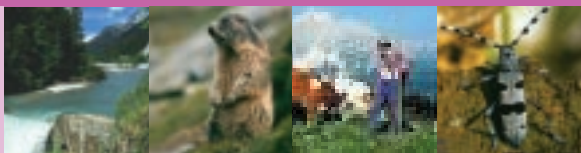


# Natura 2000 in the Alpine region



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\*\*\*\*\* **Acknowledgements:** thanks to

\*\*\*\*\* **Cover photos:** \*\*\*\*\*

**Graphic design:** \*\*\*\*\*

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Luxembourg: Office for Official Publications of the European Communities, 2005

ISBN 92-894-9984-2

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European Commission  
**Natura 2000 in the Macaronesian region**

2005 – 12 pp – 21 x 29.7 cm  
ISBN 92-894-9984-2



## The Alpine region – the rooftop of Europe

Europe has several important mountain chains which stretch across the majority of the countries on this continent. Within the EU, five of the longest and highest ranges have been included in the Alpine biogeographic region.

They comprise **the Alps** which stretch over France, Italy, Germany, Austria, Slovenia and the non EU countries of Switzerland and Monaco, **the Apennines** that run down the spine of Italy, **the Pyrenees** on the border between Spain and France, **the Scandes** which straddle Sweden, Finland and Norway and **the Carpathians** that extend well beyond the EU frontiers of Slovakia and Poland into Romania and the Ukraine.

Irrespective of their geographical location, all are characterized by a relatively cold and harsh climate, high altitudes and an often complex, varied topography. Forests and semi-natural grasslands envelop the lower slopes but, as the altitude increases and the temperature drops, trees become scarcer and eventually give way to alpine grasslands, fells and scrub heath communities. At the very top, amongst the rocks and snow, the vegetation is reduced to only a handful of highly adapted plants able to tolerate such extreme conditions.

Similar vegetation belts can be found on all mountain ranges within the alpine region but at differing altitudes. In the Scandes, for instance, the tree line is below 1000m whereas in the Pyrenees it is well above 2,000 m.

Because of their steep gradients, mountains have highly compressed latitudinal life zones. As a result, habitats and species alter rapidly with altitude. Moving 100m upwards in the mountains is equivalent to going 100km north in the

lowlands. The complex topography and differing exposures (sheltered south facing slopes, snow pockets, wind blasted crags and uneven rock screes...) also create a myriad of different micro-climates.

This helps explain why the alpine region has such a rich and diverse biodiversity. Almost two thirds of the plants on the European continent are present here. The high peaks harbour many endemics whilst, on the lower slopes, species diversity is more influenced by its transition with other biogeographical regions and the long history of compatible human land uses. Altogether, 99 habitat types, 63 plants and 97 animals listed in the Habitats Directive are found in the alpine region.

In terms of fauna, the area has become an important retreat for many species originally occurring in higher numbers in the lowlands. Large carnivores (wolves, bears, lynx) and raptors (eagle, falcons, vultures) have been drawn to the mountains because, unlike most other regions, they still harbour large unfragmented areas where human disturbance is limited.

True alpine specialists exist too. These include species of rodents (eg snow vole, *Microtus nivalis*), ungulates (eg alpine ibex, *Capra ibex*) and many invertebrates. The alpine region is especially rich in beetles and butterflies: in Italy alone, around half of the butterfly species are found above the treeline.

Some birds have also adapted well to the mountain environment including the ptarmigan *Lagopus lagopus*, chough *Pyrrhocorax pyrrhocorax* and dotterel, *Chardrius morinellus*. Many more stop over during their migration routes.

In terms of human land-use and impacts, most mountain ranges are poorly populated, particularly above 1,000m (or 500m in the case of the Scandes) due to the harsh climate, difficult access and short growing seasons. Traditional pastoral farming practices have, nonetheless, been the



mainstay of the mountain economy for centuries and have contributed further to the region's already rich biodiversity. These land-uses are, however, now rapidly disappearing under the combined pressure of land abandonment and intensification.

Other more recent activities are also impacting on this particularly fragile environment. These include, amongst others, mass tourism, large scale afforestation and deforestation, the damming and channeling of alpine rivers and the construction of roads.

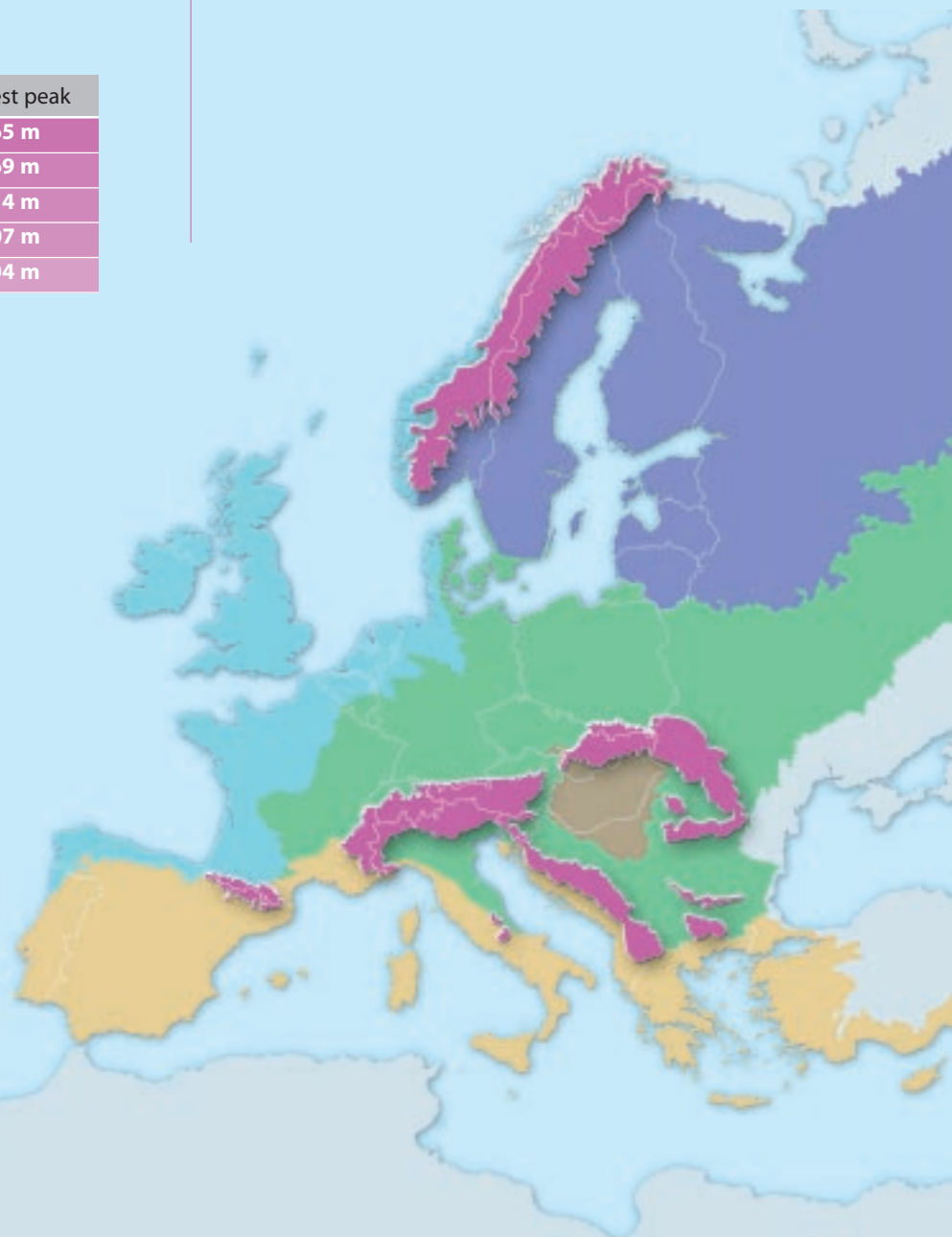
Climate change presents another major threat. Because of the tight ecological and climatic bands in the mountains a small change could have devastating effects on their ability to absorb and retain water. Already there is evidence that the glaciers are shrinking, if they diminish further one can expect significantly more drought in the lowlands and marked changes in vegetation in the mountains, particularly at the higher elevations.

**Mountain ranges in the EU alpine biogeographic region:**

	Length of range	Highest peak
Carpathians	1,450 km	2,665 m
Scandes	1,400 km	2,469 m
Apennines	1,350 km	2,914 m
Alps	1,200 km	4,807 m
Pyrenees	430 km	3,404 m

Region	Countries involved	% of EU 25 territory
Atlantic	Ireland, United Kingdom, France, Belgium, Germany, Netherlands, Denmark, Spain, Portugal	20.0
Boreal	Sweden, Finland, Estonia, Latvia, Lithuania	20.4
Continental	Denmark, Sweden, Germany, Poland, Belgium, Luxemburg, France, Italy, Czech Republic, Slovenia, Austria	26.3
Alpine	Spain, France, Italy, Germany, Austria, Slovenia, Sweden, Finland, Poland, Slovakia	7.6
Pannonian	Hungary, Slovakia, Czech Republic	2.9
Mediterranean	Greece, Cyprus, Malta, Italy, Spain, Portugal, France	22.5
Macaronesian	Spain, Portugal	0.3

Source: European Topic Centre for Nature Conservation (EEA). Statistics based on data and information submitted by Member States on 31 December 2004.





## The Alps

The Alps are one of the highest mountain chains in Europe. They form a crescent 1,200 km long and 200 km wide across 8 countries. Several peaks rise above 4,000m, including Mont Blanc which, at 4,807m, is the highest summit in Europe.

Originally formed by a powerful collision between the African and Eurasian continental plates, the exposed crystalline rock formations have since been extensively remodeled and sculptured by torrential alpine rivers, retreating glaciers and the relentless pressure of snowmelt and frost. This has helped create an extremely complex labyrinth of mountain ranges interspersed by long deep valleys and alpine rivers. Several of Europe's most important rivers originate in the Alps such as the Rhine, Po and Rhone.

The Alps also act as a bridge between the Mediterranean climate in the South and the more temperate weather in the North and this is reflected everywhere in the type of habitats and species present. Over half of the Alps are covered in forests. To the north, the lower slopes are dominated by deciduous trees whereas, in the south, they are mainly covered in evergreen woods. Coniferous forests prevail on the higher altitudes and the drier inland areas where the rainfall is considerably lower. In general, the forests are still in a relatively natural state, particularly at

higher elevations, and so provide an important refuge and ecological corridor for many of the larger species, such as bears and wolves.

Grasslands and mountain meadows make up a further 25% of the alpine vegetation. Most are semi-natural, having been influenced by centuries of extensive farming practices. However, many are now under serious threat as more and more farmsteads are being abandoned. Altogether, 79 habitat types listed in the Habitats Directive are present in the Alps, including several above the tree line such as the alpine heaths, siliceous grasslands with *Juncus* or various types of rocky slopes and scree.

In terms of plants, the Alps are one of the richest places in Europe, second only to the Mediterranean region. About 40% of Europe's flora is present here (including 30 species on the Habitats Directive). Many have adapted to the harsh conditions by growing into flat cushions, rosettes or carpets to protect them from the wind and snow or by developing hairs and parabolic flowers to retain the heat. The Pasque flower and alpine poppy are prime examples.

As for the fauna, the majority of the 80 mammal species in the Alps are small rodents, bats or ungulates. As in other mountain ranges, many are relicts from the last ice age having been left behind when the ice sheets retreated. Several are now evolving into separate sub-species – eg Bavarian vole, Alpine ibex ...

The Alps are also home to an immense diversity of invertebrates. There are supposedly more beetles in the Western Alps alone than in all of the United Kingdom. Some are now so rare that they have had to be included in the Habitats Directive such as the colourful *Rosalia alpina* or the iridescent *Carabus olympiae*. Finally,

The Alps are just as important for their birds, at least 200 species breed in the mountains and a further 200 migrate through or spend the winter here.

The Alps may be amongst the richest mountain ranges in Europe but they are also one of the most intensively exploited. Over 11 million people live in the Alps, mostly in the increasingly urbanized valleys. A further 100 million people visit the mountains for tourism and recreation. All this puts immense pressure on the fragile environment. What is more, virtually all the major alpine rivers have been damned for hydro-energy or straightened and canalised for agricultural purposes causing wide ranging environmental impacts both within and outside the alpine region.

### Mountains: the domain of the large birds of prey

Raptors reign supreme in the mountains of the alpine region. Many have sought refuge here to escape persecution and to benefit from the few remaining large remote areas left in Europe. None is more emblematic than the bearded vulture (*Gypaetus barbatus*). This species became extinct in the Alps at the turn of the century but has since been re-introduced. So far about 130 individuals have been re-released into the wild and a coordinated programme is underway to conserve this endangered species across the mountain ranges of Europe.



# Map of Natura 2000 sites in the Alpine region

The list of Natura 2000 sites in the Alpine region was adopted in January 2004. A total of 959 Sites of Community Importance were selected covering almost 97,000 km<sup>2</sup>. This represents 37% of the region. In Finland and Sweden, the majority of the sites are over 10,000 ha reflecting the largely pristine and unfragmented nature of the Fennoscandian (Scandes) mountain range. In the other mountain ranges the extent of Natura 2000 is also significant but the individual sites themselves are usually smaller, especially in the Alps.

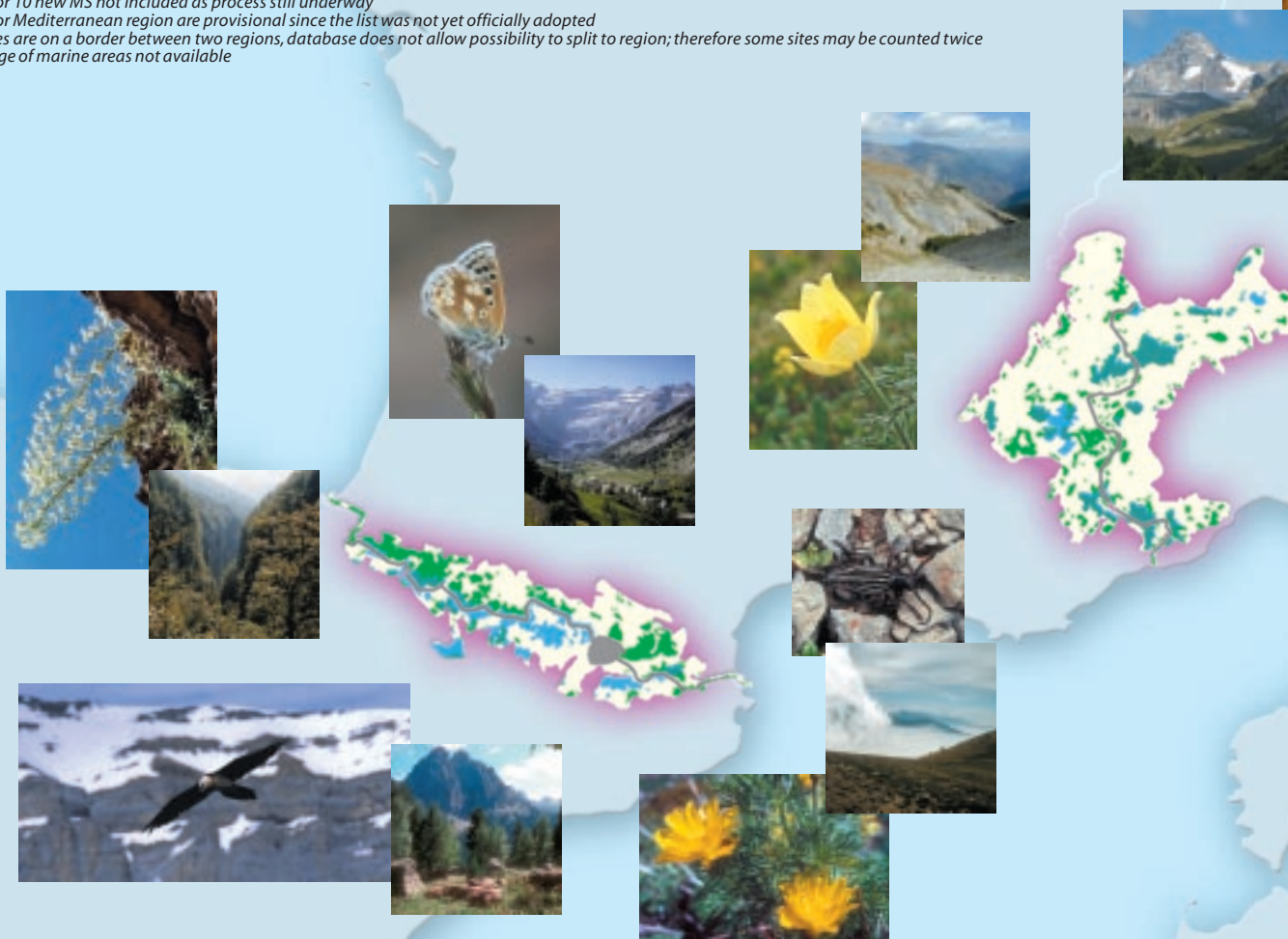
Region	Habitat types	Animals	Plants
Atlantic	117	81	52
Boreal	87	68	58
Continental	144	149	83
Alpine	105	134	97
Pannonian	54	109	38
Mediterranean	146	160	270
Macaronesian	38	22	129

Source: European Topic Centre for Nature Conservation (Paris)  
 - the number of habitats and species per biogeographical region is not definite since the reference lists for the 10 new Member States have still to be finalized, the exception being the Macaronesian region  
 - the figures are not cumulative since many habitats and species occur in two or more biogeographical regions

The list has still to be completed with sites from the three new Member States in the Alpine region – Slovenia, Slovakia and Poland – who joined the EU on 1 May 2004. With them comes an entirely new mountain range to the alpine region – the Carpathians.

Region	Natura 2000 sites	Total area covered	Terrestrial area covered	Marine area covered	% of terrestrial area of region
Atlantic	2,419	93,811 km <sup>2</sup>	64,954 km <sup>2</sup>	28,858 km <sup>2</sup>	8
Boreal	5,026	82,377 km <sup>2</sup>	73,003 km <sup>2</sup>	9,375 km <sup>2</sup>	12
Continental	4,958	49,194 km <sup>2</sup>	40,838 km <sup>2</sup>	8,356 km <sup>2</sup>	6
Alpine	956	96,751 km <sup>2</sup>	96,751 km <sup>2</sup>	-	37
Mediterranean	2,783	180,609 km <sup>2</sup>	167,898 km <sup>2</sup>	12,712 km <sup>2</sup>	19
Macaronesian	208	5,310 km <sup>2</sup>	3,516 km <sup>2</sup>	1,794 km <sup>2</sup>	34
<b>Total EU 15</b>	<b>16,193</b>	<b>458,615 km<sup>2</sup></b>	<b>397,488 km<sup>2</sup></b>	<b>61,127 km<sup>2</sup></b>	<b>12</b>

Source: European Topic Centre for Nature Conservation (Paris)  
 - SPAs not included in the above table as they are not selected according to biogeographical region  
 - Figures for 10 new MS not included as process still underway  
 - Figures for Mediterranean region are provisional since the list was not yet officially adopted  
 - Some sites are on a border between two regions, database does not allow possibility to split to region; therefore some sites may be counted twice  
 - Percentage of marine areas not available









## The Apennines

The Apennines form the backbone of Italy. Most of the range is montane in character but only the central areas are high enough to be included in the Alpine biogeographical region. Several peaks rise above 2,000m, the highest being Corno Grande (2,912m). Europe's most southerly glacier – the Calderone – is also located here.

Much of the Apennines is made up of limestone and dolomite rocks which give rise to many karst phenomena, such as hollows, caves, underground water channels and deep gorges. This creates a unique landscape of gentle peaks and vast alpine plateaus interrupted every now and then by abrupt canyons and vertiginous rock faces.

The climate is heavily influenced by the Mediterranean lowlands and the winds from the Adriatic. This provides an ideal environment for the characteristic Apennine beech forests, often with *Ilex* and *Taxus sp.*, which cover almost two thirds of the central range. Most of these forests are still in fairly natural condition. Small patches of the relictual mountain pine *Pinus mugo* and dwarf juniper *Juniperus nana* are also found above the tree line, amongst the vast alpine grasslands and cushion scrubs.

In all, 40 habitat types listed in the Habitats Directive are present here. The floristic value is consequently also very high. Over 2,000 species of plants have been recorded in the Apennines, including many endemics such as the

rock jasmine *Androsace mathildae* and the Apennine pheasant's eye *Adonis distorta*. Both are in the Habitats Directive.

Isolated populations of the Apennine wolf, Marsican brown bear and Abruzzi chamois have also sought refuge in the Apennines. Almost hunted to extinction the endemic chamois is now slowly recovering thanks to a concerted re-introduction programme and strict protection. Other typical species include the endemic spectacled salamander, *Salamandra terdigitata* and the rare Orsini viper, *Vipera ursinii* which lives on the high plains above 1,700m.

As elsewhere in remote mountain areas, human populations in the Apennines are low and decreasing. Traditional agropastoral systems are disappearing as a result. Now that most of the Central Apennines are included in a network of interlinking national parks, efforts are underway to revive the mountain villages through carefully planned eco-tourism initiatives. Large scale infrastructure developments nevertheless remain a threat. The construction of a large underground nuclear plant and road tunnel caused much controversy in the 1990s. Similar development schemes are still being considered.



## The Scandes

Shaped by successive periods of glaciation, the Scandes are the oldest mountains in the Alpine region. They run 1,400 km down the spine of Scandinavia from the northernmost parts of Finland to southern Sweden and Norway. The average elevation is 500m, although several peaks rise above 1,000m and occasionally even above 2,000m. Europe's largest mountain plateau – the Hardangervidda is also located here, stretching over 8,000km<sup>2</sup>.

Weather conditions are generally very harsh with temperatures around freezing for most of the year. The west is influenced by the ocean and the Gulf Stream whilst the East is more continental in nature with less wind and rainfall. Because of these difficult conditions, over half the Scandes are without trees, vast areas are covered instead in fell vegetation dominated by typical moorland species such as heather, grasses, and sedge. Occasionally, rare buttercups (eg *Ranunculus lapponicus*) and poppies, (eg *Papaver laestadianum*), appear in pockets of rich soil and high humidity as does the tiny Lapland rhododendron *Rhododendron lapponicum* which is only 5–15 cm high.

In areas of permafrost, pulsa mires emerge with their mounds of frozen and sometimes exposed peat. At higher elevations, the vegetation becomes so rare that much of the landscape is dominated by bare rock and boulders. Only a few vascular plants, such as the



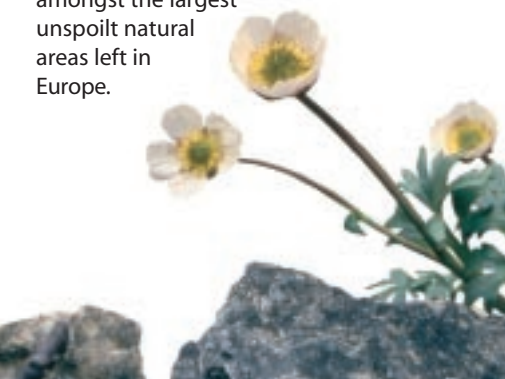


## The Pyrenees

glacier crowfoot *Ranunculus glacialis* can survive here. Lower down, patches of stunted birch and sub-arctic willow scrub appear around the tree line. Lower still the slopes become enveloped in mountain birch *Betula pubescens czerepanovii* which is the dominant forest type for the Scandes.

Compared to other alpine mountains, the Scandes have a relatively low species diversity. Yet they remain a vital component of Europe's biodiversity in view of their immense size and pristine nature. Altogether 44 habitat types, 26 plants and 16 animal species listed on the Habitats Directive are found here. What is more, many of the animals present are restricted to the circumpolar region such as the arctic fox, lemming, wolverine, snowy owl and gyrfalcon.

Not surprisingly, human presence is very low in the Scandes. Some activities like river damming for hydroelectric power, increased reindeer herding or loss of summer grazing have had damaging effects on the local environment. However, most of the mountains remain undisturbed by human influences and are, as a result, amongst the largest unspoilt natural areas left in Europe.



Stretching from the shores of the Mediterranean Sea to the Atlantic Ocean, the Pyrenees are the smallest of the mountain ranges in the alpine region. The chain is 430km long and 10km wide at its eastern end but this expands to 150km in the central zone. The highest summit is Pic D'Aneto, at 3,404 m.

The northern and southern slopes contrast strongly with one another. In the north, the mountain descends abruptly onto the broad plains of Aquitaine and Languedoc. Rainfall is abundant due to the influences of the Atlantic Ocean and, as a consequence, much of the mountainside is covered in beech and fir. The Southern slopes, on the other hand, are much drier and have gentler gradients. This is better suited to Scots pine, juniper and, lower down, evergreen oak.

Above the tree line (2,400–2,900m), the vegetation is very similar to the Alps if somewhat less diverse. Dwarf willows hug the ground along with alpine heaths and grasslands. Altogether, 60 habitat types listed in the Habitats Directive occur in the Pyrenees, including a type of siliceous grassland dominated by *Festuca eskia*, which is unique to the area. The Pyrenees also have an abundance of torrents, cascades and lakes. There are over 1,500 lakes above 1,000m.

Like in the Alps, plant diversity is very high. Some 3,000 species of vascular plants have been recorded in the Pyrenees of which at least 120 species are endemic, including *Alyssum pyrenaicum* and *Aster pyrenaicus*, both of which are on the Habitats Directive.

The diversity of birds and animals is equally impressive. Forty-two species of mammal are present (11 in the Habitats Directive) including rare endemics like the Pyrenean desman *Galemys pyrenaicus* and the Pyrenean ibex *Capra pyrenaica pyrenaica*. The ibex unfortunately died out in 2001. Persecuted by over hunting, rescue actions came too late to save it from extinction.

From a socio-economic perspective the Pyrenees are much less populated than the Alps although here too farming and shepherding were the main activities until recently. The Pyrenees were also heavily deforested in the past. Traces of this exploitation can be seen in almost every valley. Beech, in particular, was used for firewood and to stoke furnaces for metal extraction. More recently, there has been a surge in tourism, especially for ski resorts.





## The Carpathians

The Carpathians are the youngest and most easterly of the mountains in the alpine region. They extend in a huge arc over 1,450km from Slovakia to Romania. The range is twice as narrow as the Alps and the peaks are half as high. Only a third of the range is currently in the EU.

On the outer slopes, the dominant bedrock is made up of sandstone and shale (flysch) whilst the interior contains a chain of volcanic mountains. The whole range is heavily influenced by the surrounding continental climate. This is responsible for the large temperature variations between winter and summer (from -21°C to +35°C).

Because the Carpathians have a relatively low altitude, the upper alpine and nival zones are generally missing. In fact, only 5% of the land is above the tree line. Instead, montane forests cover most of the range. The foothills are dominated by sessile oak *Quercus petraea*, whilst beech forests prevail in the montane region. On the higher reaches they merge into mixed stands of beech-fir or beech-fir-spruce, eventually giving way to pockets of larch and Arolla pine.

These natural montane forests are the most extensive in the EU (over 300,000ha in total) and contain some of the most important vestiges of virgin beech forest left on the



### Slovak laurel

Named after a nymph who changed herself into a beautiful bush to escape the Greek god Apollo, the Slovak laurel (*Daphne arbuscula*) is a very unusual plant indeed. It is one of the few ancient species to have evolved before the Carpathian mountains even existed. Today, this attractive evergreen shrub, with its coral red shoots and bright flowers, is found only in a small area of the Carpathians in Slovakia where it is strictly protected both nationally and through the Habitats Directive.

continent. As a consequence, they are extremely species-rich. Over 300 bird species can be found here, including the pied flycatcher *Ficedula hypoleuca*, Ural owl *Strix uralensis*, white-backed woodpecker *Dendrocopos leucotus* and the alpine accentor *Prunella collaris*. Other typical species include the Tatra pine vole *Microtus tatricus* and Carpathian marmot, *Marmota marmota latirostris*, both of which are included in the Habitats Directive due to their restricted range.

The Carpathians are however most famous for harbouring Europe's biggest populations of large carnivores. Roughly 8,000 bears, 4,000 wolves and 3,000 lynx still roam the mountains, representing more than 40% of the total EU population. Although under increasing pressure from excessive hunting, these groups provide a vital source of animals for the rest of the EU. The Carpathians are in fact a major corridor for species migration and dispersal due to their strategic location between the east and west.

The Carpathians are also very rich in flora. Over 3,500 species have been recorded so far including many rare and characteristic species such as the *Cyclamen fatrense*, *Pulsatilla slavica*, *Tozzia carpathica* and *Daphne arbuscula* (all of the Habitats Directive).

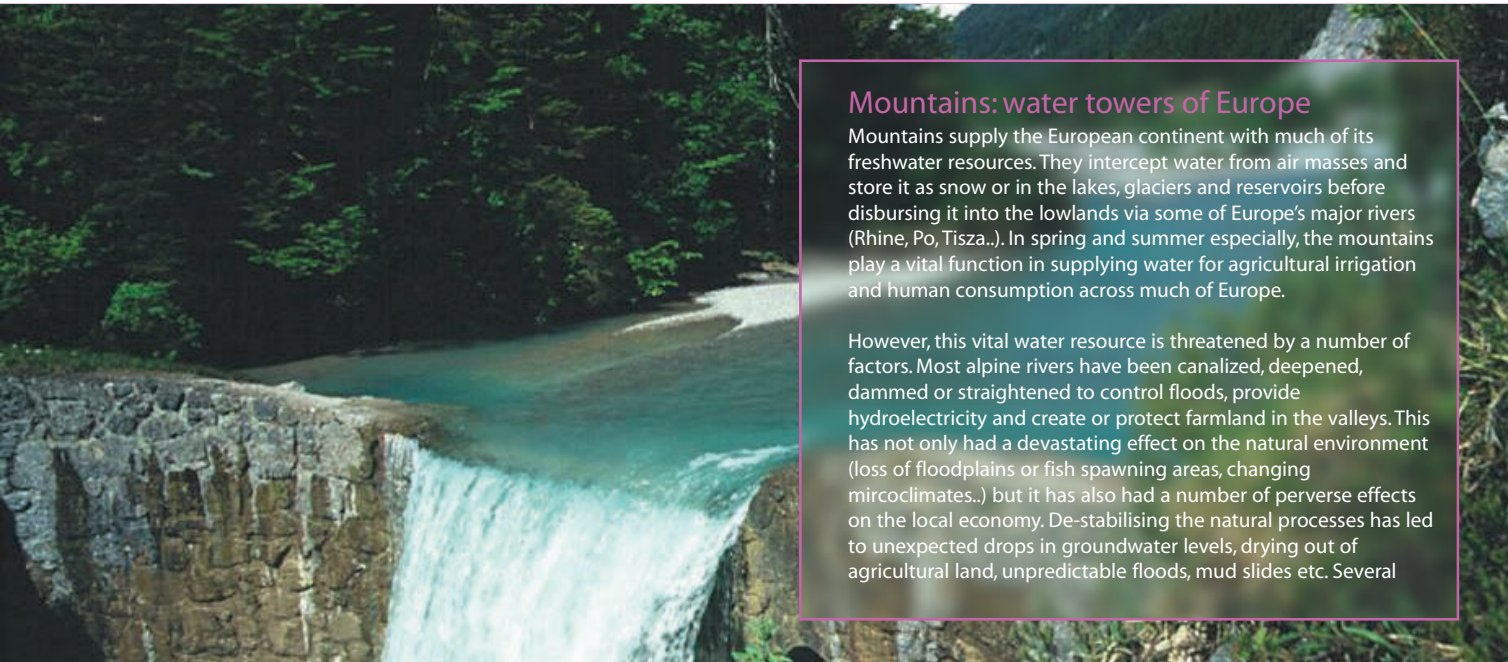
The Carpathians contain numerous small lakes (many of glacial origin) and a dense network of rivers and streams which are well nourished by the abundant rainfall. The rivers and streams, in particular, are amongst the cleanest in the EU. Very few of those at higher altitude have been modified by man. They provide a haven for more than 100 species of fish and numerous amphibians such as the rare montandon's newt *Triturus montandoni*. Otters, too, are common with densities of up to one per 10–15 km<sup>2</sup> in some parts.

Like the Alps, the Carpathians are populated by a variety of cultures and nationalities. Around 16 million people live here and most are still actively involved in extensive pastoral activities. However, the recent change towards a market economy poses a major threat to the continued viability of mountain farms and villages.

The changeover from the Communist regime also has major implications for the mountain's precious forests. Many of forest parcels which were seized during the Communist era are being returned to their rightful owners through a process of land restitution. But as most owners are no longer associated with their land, they are more likely to clearfell their forests for a quick economic gain rather than go back to long term forest management.







### Mountains: water towers of Europe

Mountains supply the European continent with much of its freshwater resources. They intercept water from air masses and store it as snow or in the lakes, glaciers and reservoirs before discharging it into the lowlands via some of Europe's major rivers (Rhine, Po, Tisza...). In spring and summer especially, the mountains play a vital function in supplying water for agricultural irrigation and human consumption across much of Europe.

However, this vital water resource is threatened by a number of factors. Most alpine rivers have been canalized, deepened, dammed or straightened to control floods, provide hydroelectricity and create or protect farmland in the valleys. This has not only had a devastating effect on the natural environment (loss of floodplains or fish spawning areas, changing microclimates...) but it has also had a number of perverse effects on the local economy. De-stabilising the natural processes has led to unexpected drops in groundwater levels, drying out of agricultural land, unpredictable floods, mud slides etc. Several

## Managing sites in the Alpine region

Europe's mountain areas have been inhabited since Neolithic times despite their difficult topography and inhospitable climate. Extensive farming practices, transhumance and small-scale forestry have all contributed to a complex mosaic of different cultures and landscapes which has considerably enhanced the already rich biodiversity of the region. Until recently such activities formed the mainstay of mountain economies across Europe.

These traditions are however now rapidly disappearing. Unable to expand or intensify, most farmsteads at high altitude have gradually been abandoned. Today, it is estimated that only 4% of the workforce in mountain areas of the EU-15 are involved in primary sector activities such as farming and forestry, compared to as much as 70% in the service sector (eg tourism).

For most mountain ranges the increasing marginalization of traditional farming practices has not only affected the natural environment but also disrupted the local economy and led to a steady population decline. Yet, if properly integrated into the new rural development initiatives, Natura 2000 could help revive these local economies by supporting traditional farming practices and encouraging the development of sustainable forms of tourism based on the area's natural and cultural heritage. Such initiatives are already proving successful in the Apennines.

Most tourism to date however focuses on winter skiing which requires massive infrastructure development. At least 10% of the Alps have been transformed into winter ski resorts so far but their impact, in terms of pollution, soil compaction, changes in local vegetation etc... is felt well beyond their boundaries. Similar developments are starting up in the Pyrenees and the Carpathians.

Increased traffic is another major problem. Both old and new roads present a major barrier to species migration. It is estimated that 150 million people travel across the Alps every year, 83% by road. The forecast is for ever more traffic not only because of tourism but also because several of the mountain ranges represent important transport corridors across Europe.

Another major concern in the mountainous regions has been the damming and channelling of most major alpine rivers for hydroelectricity or agricultural intensification. This has considerably altered the natural environment both within and outside the alpine region and caused unwanted side effects in terms of lower groundwater levels, bank erosion and sedimentation.

Many of these problems are further exacerbated by the general lack of coordinated land use development across the mountain range as a whole. Most mountains are located on the border between different countries and are often considered peripheral or marginal. Recognising this, several initiatives have recently been launched to promote a more coherent management approach at the level of individual mountain ranges, such as the Alpine and Carpathian Conventions.

The recent changes to the EU's rural Development Programme also offers increased opportunities for using Natura 2000 to stimulate inward investments and new economic opportunities based on the mountains valuable natural values.



## In this series:

- Natura 2000 in the **Alpine** region
- Natura 2000 in the **Atlantic** region
- Natura 2000 in the **Boreal** region
- Natura 2000 in the **Continental** region
- Natura 2000 in the **Macaronesian** region



The European Union has seven biogeographical regions, each with its own characteristic blend of vegetation, climate and geology. Natura 2000 sites are selected according to each region on the basis of national lists submitted by each Member State within that Region. Working at this level makes it easier to conserve species and habitat types under similar natural conditions across a suite of countries, irrespective of political and administrative boundaries. Together with the Special Protection Areas designated under the Birds Directive, the Natura 2000 sites selected for each biogeographical region make up the ecological Natura 2000 network which spans all 25 countries of the EU.

