Iberian Forests

Structure and Dynamics of the Main Forests in the Iberian Peninsula

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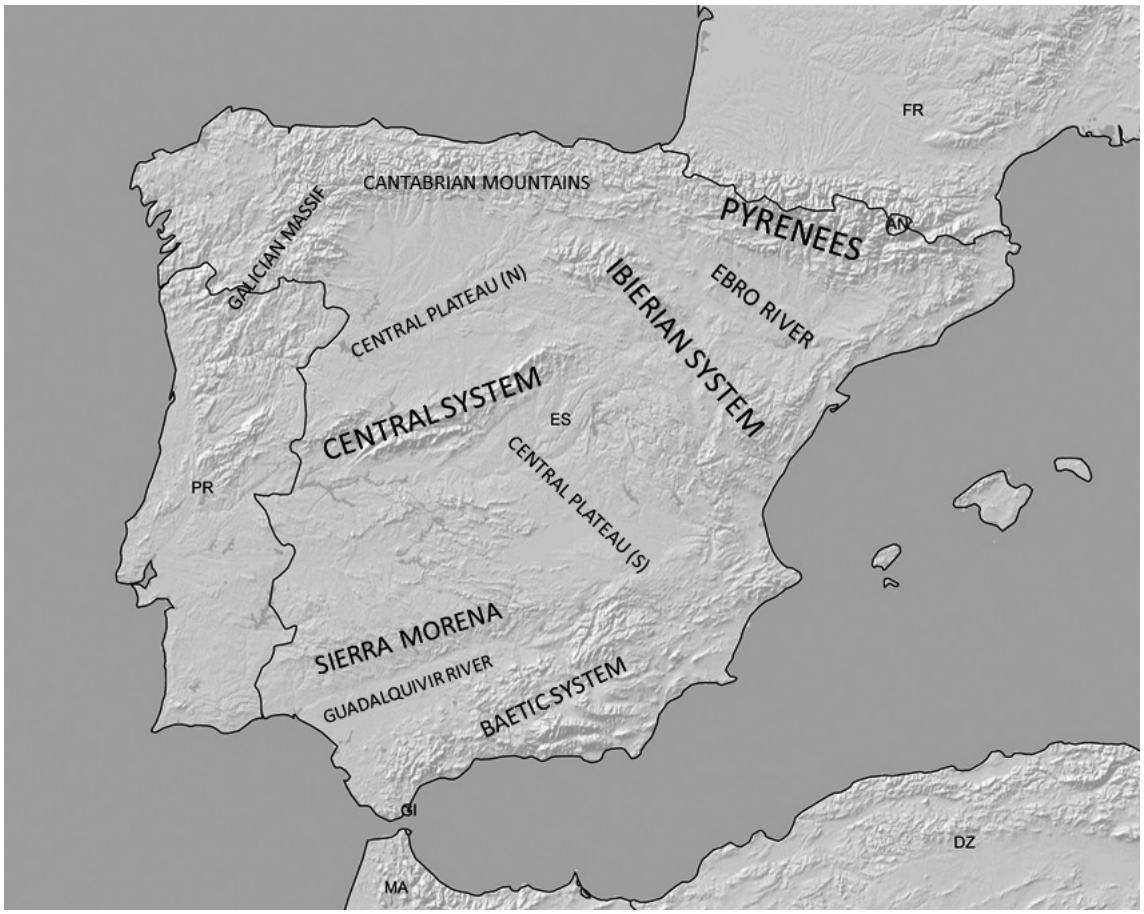
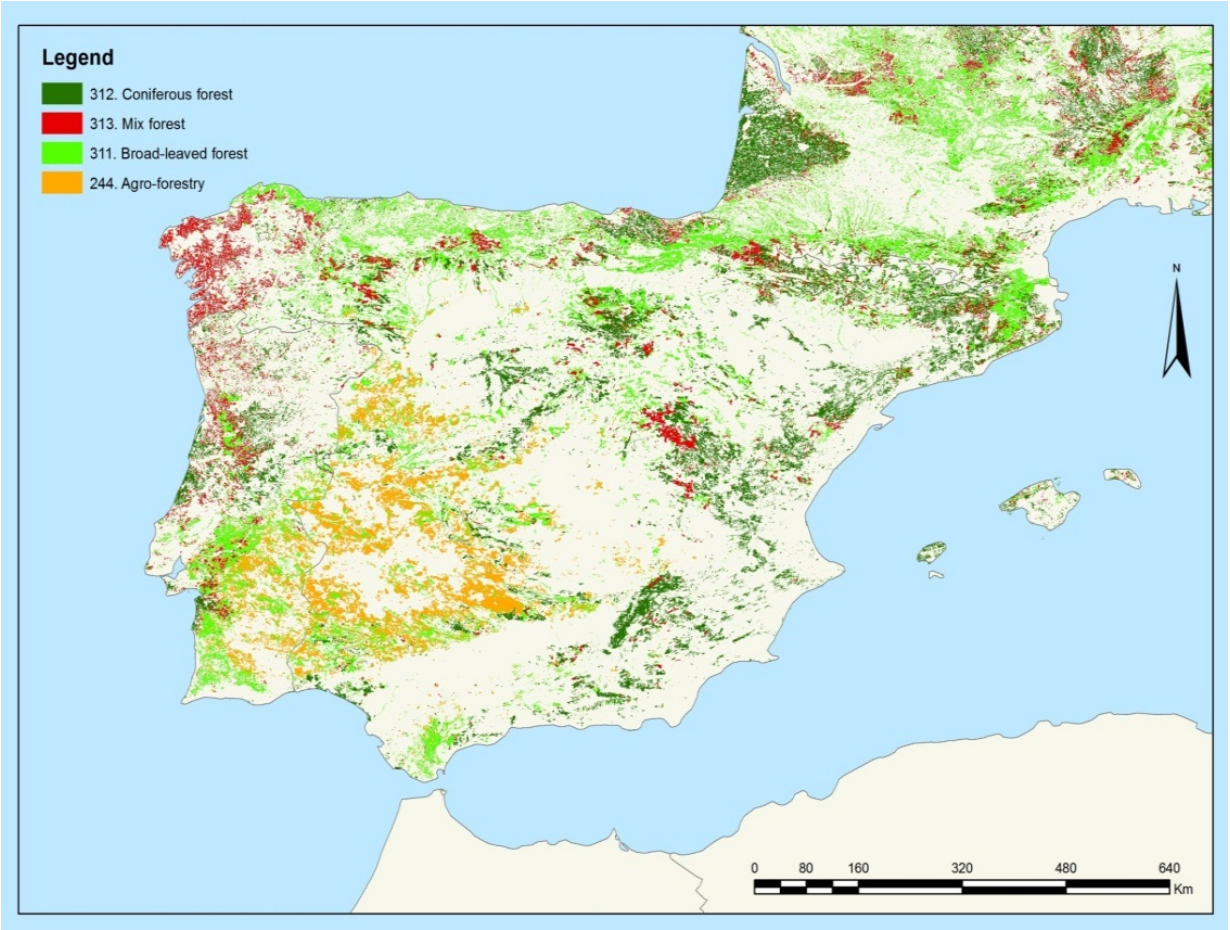
1. PHYSICAL GEOGRAPHY OF THE IBERIAN PENINSULA.

1.1. Topography: Many different mountain ranges at high altitudes. Two plateaus 800–1100 m a.s.l. By contrast, many areas in Europe are plains with the exception of several mountain ranges such as the Alps, Urals, Balkans, Apennines, Carpathians, Caucasian and Scandinavian areas. Topographic diversity in the Iberian Peninsula has led to a high variety of ecosystems. The main mountain ranges in the Iberian Peninsula are the Baetic System (Subbaetic and Penibaetic), Sierra Morena, Central System, Iberian System, Galician Massif, Cantabrian Mountains and Pyrenees. Summits above 3,000 meters are frequent in the Peninsula.



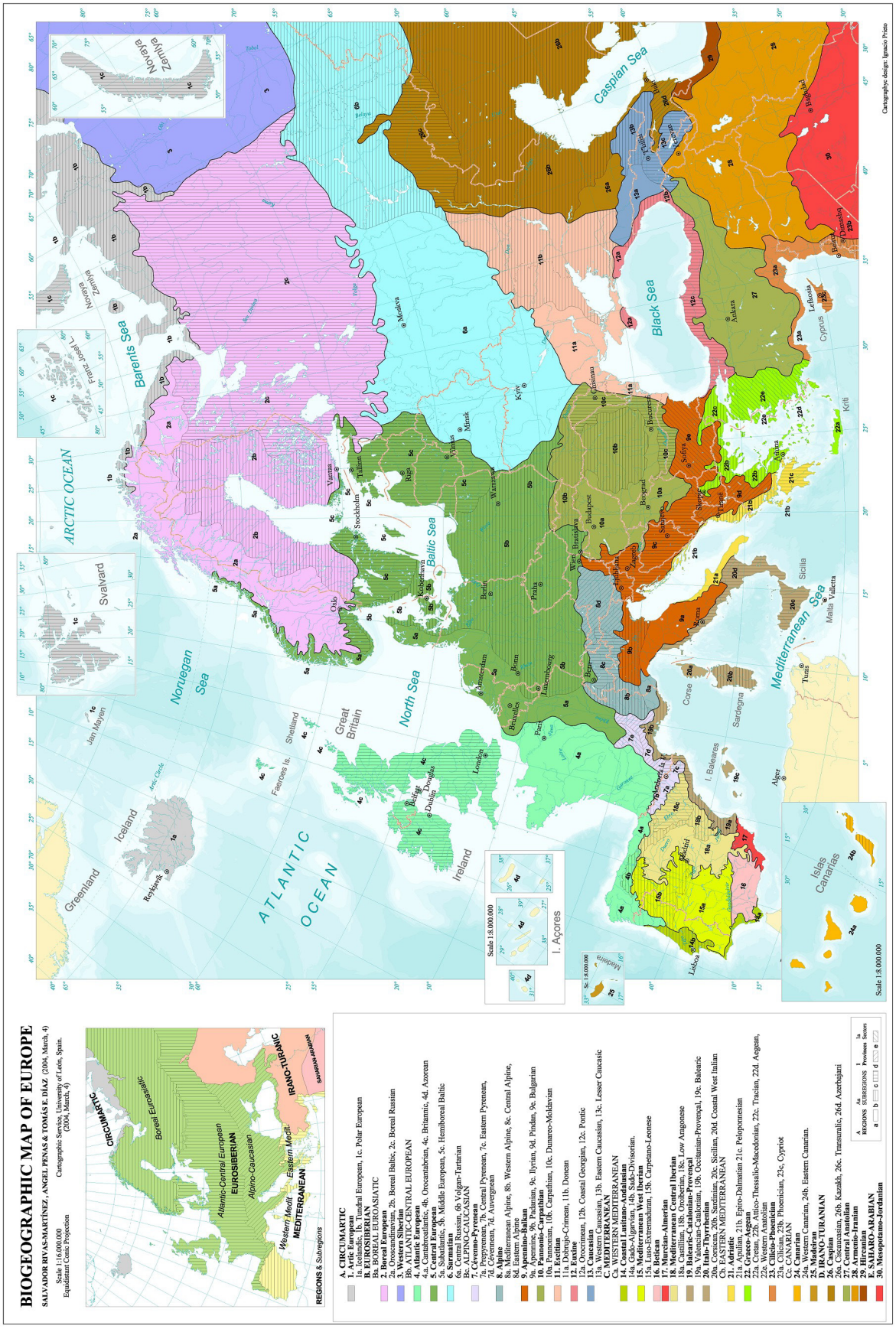
Digital elevation model, mountain ranges and rivers (Source: compiled by author using GTOPO 3.0)

1.2. Land uses. Originally, 90% of the Iberian territory was covered by forests. At present, only 15% remains, especially in protected natural areas. Intensive alterations (deforestation mainly) have replaced former forests with crops, foreign forest species (eucalyptus and pine in the main), pasture, urban fabric and abandoned land. The map represents coverage with coniferous (needle tree, evergreen, Gymnosperm), broad-leaved (deciduous or evergreen, Angiosperm) and mixed (Gymnosperm and Angiosperm) forests.



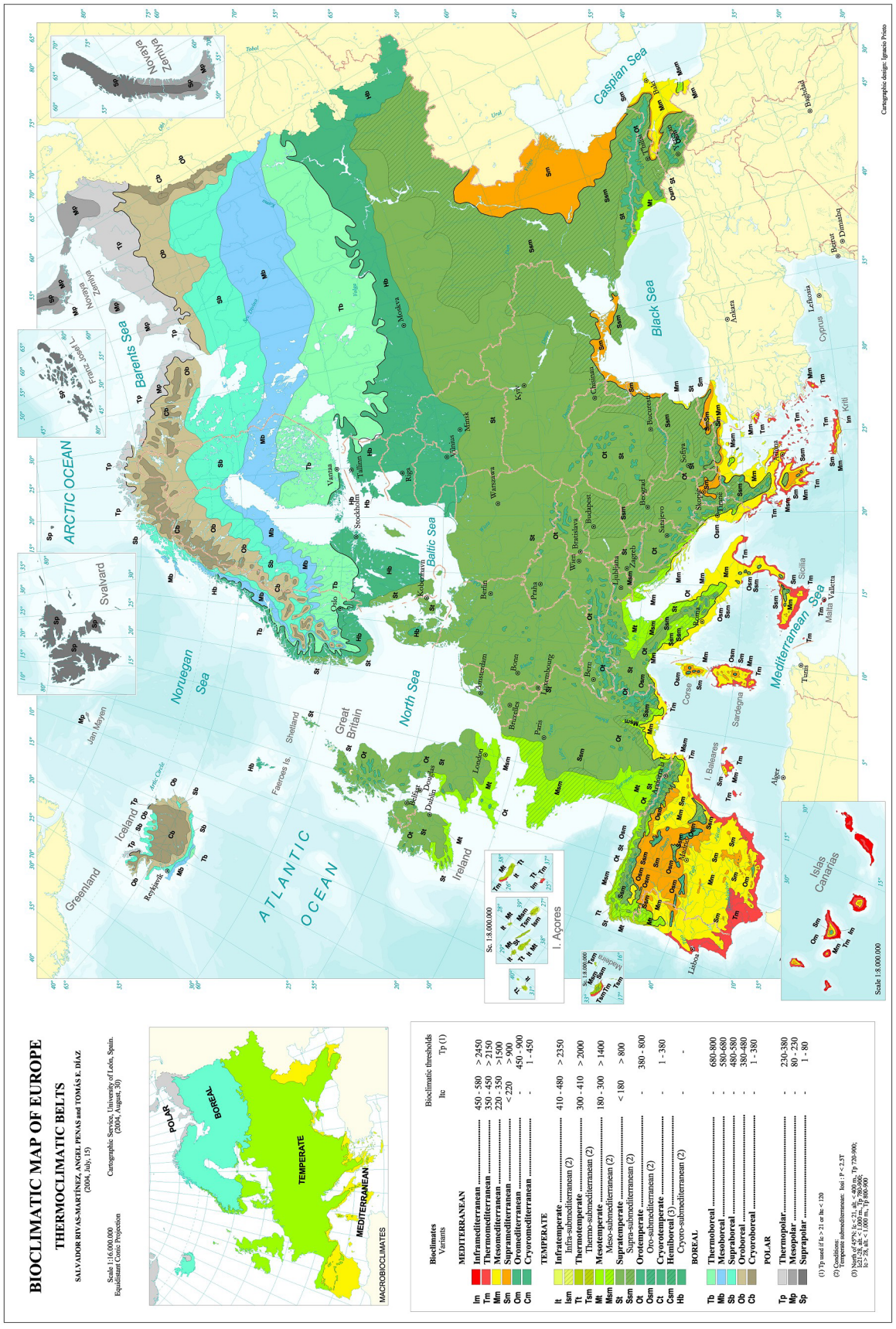
Forest distribution in the Iberian Peninsula (Source: compiled by author using Corine Land Cover database, 2006)

1.3. Biogeography. Biogeography is the study of the distribution of species and ecosystems in geographic space through geological time. The geographic classification includes Kingdom, Region, Province, District and Sector. The Iberian Peninsula belongs to the **Holarctic Kingdom**. The north and northwest belong to the Eurosiberian Region, whereas the central, south and east belong to the Mediterranean Region.



(Source: Reproduced from www.globalbioclimatics.org)

1.4. **Bioclimatology**. Bioclimatology is the science that studies the interactions between the biosphere and atmosphere. This science explains the influence of climate on the distribution of species. Both biogeography and bioclimatology use the concept of **Biome**. A biome is a large geographical area hosting distinct plant and animal groups which are well adapted to the particular environment. The EuroSiberian Region of the Iberian Peninsula has a Temperate bioclimate. As a result, **temperate forests** prevail. In the Mediterranean Region, the bioclimate is Mediterranean, so the main forests are of the **Mediterranean** type.

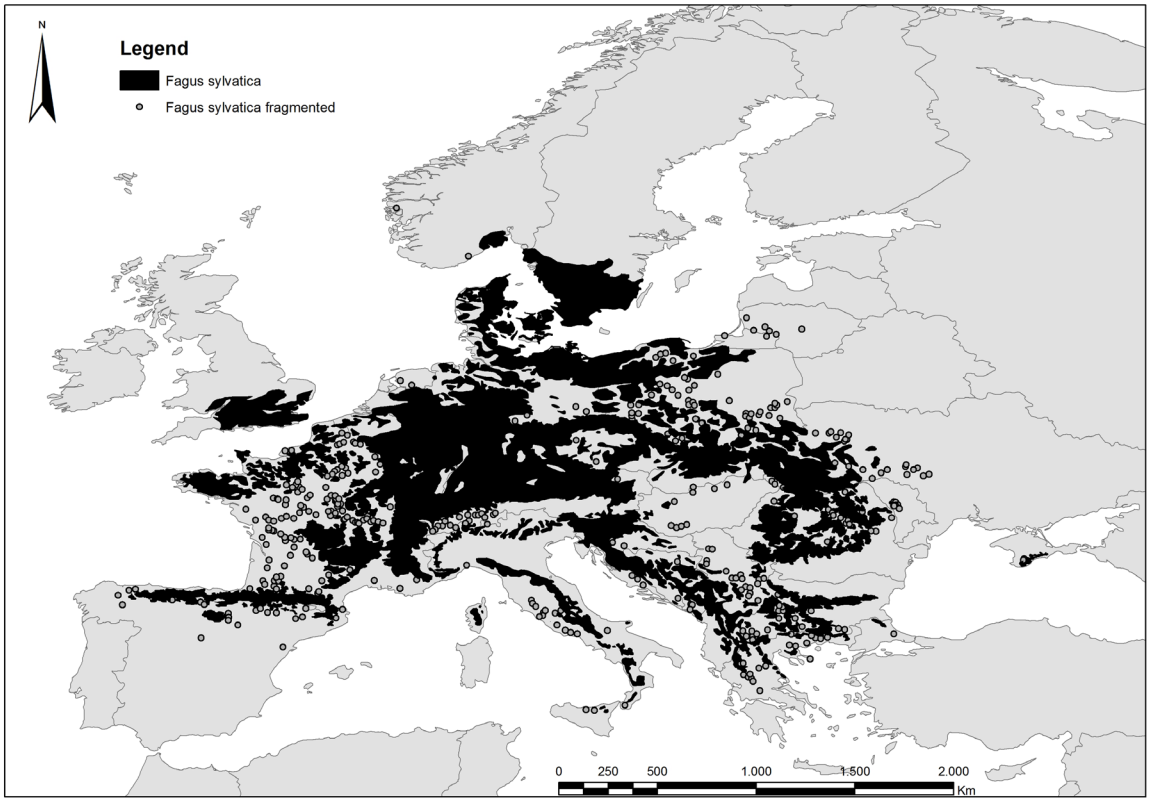


(Source: Reproduced from www.globalbioclimatics.org)

2. TEMPERATE FOREST (ATLANTIC FOREST).

2.1. Introduction. Temperate forests are under the influence of the Atlantic Ocean. Precipitation amounts to 1000–1500 l/year. Minimum temperatures in winter fall below 0 ºC and summers have no drought period. All species are deciduous. In the Eurasian continent, the coniferous forests (Taigas, evergreen) prevail in the north and Mediterranean forests (evergreen) in the south. About 8% of the original forests remains in the Iberian Peninsula. Forests have been intensively transformed into crops and pasture, and wood was used to produce vegetable coal.

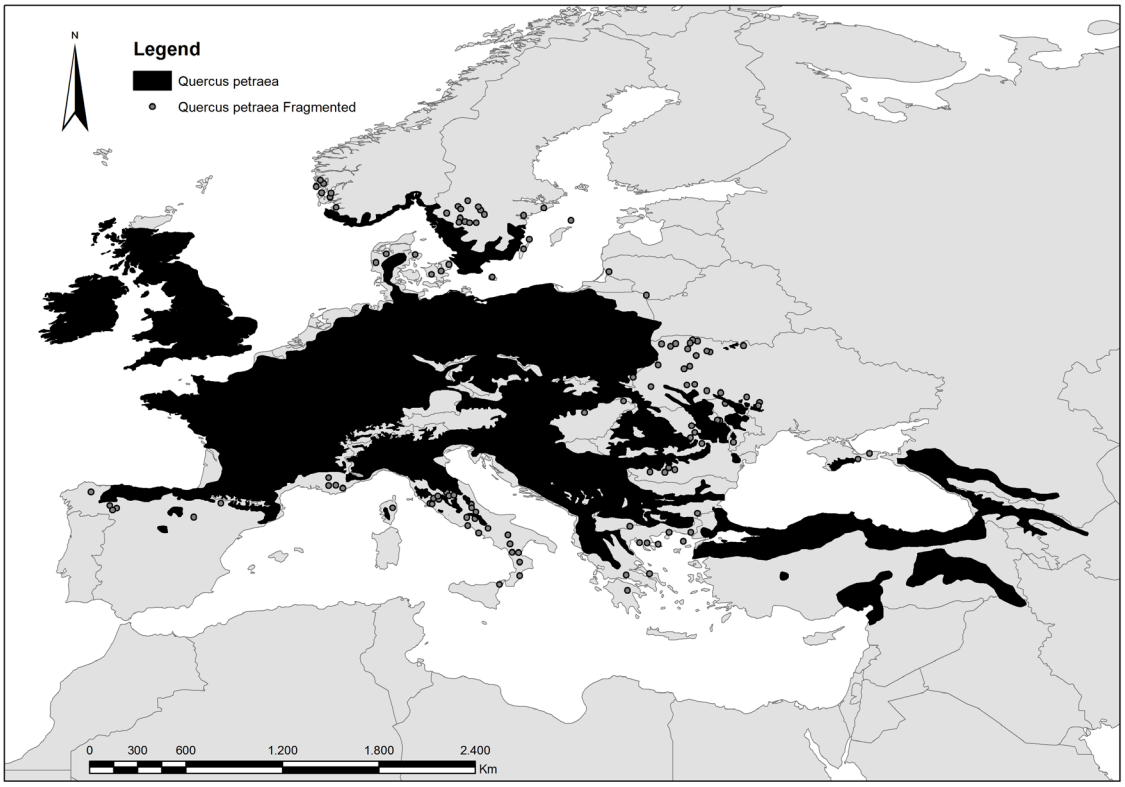
2.2. Beech forest. *Fagus sylvatica*. Fagaceae. Deciduous plants 30–35 m tall occurring 1000 to 1700 m a.s.l. Gray bark. 300 years. Fruit: beechnut ripening in autumn. Alternate fruit production. Density 200–400 trees/ha. Sensitive to strong winds (low deep root system). The genus *Fagus* is well distributed in the northern hemisphere. *Fagus sylvatica* occurs widely in western Europe, from the Scandinavian Peninsula to Sicily. This is the most recent forest type in the Iberian Peninsula, where it dates back 10 000 years. Trees occur mainly in the north (particularly in the Euro-Siberian region). The largest beech forest in Spain, *Selva de Irati*, is a natural reserve spanning 17 000 ha in Navarre. Beech trees have a high evapotranspiration rate. This makes them highly competitive in places with frequent fog (e.g., a northern orientation). The canopy intercepts 90% of sunlight; as a result, undergrowth is scarce and single-species forests are frequent. Beech forests are well preserved because their natural locations are unsuitable for agricultural purposes owing to too much fog and little sunlight.



Distribution of beech forests in Occidental Europe (Source: Compiled by author using data from www.euforgen.org)

2.3. Oak forests.

Quercus robur. Fagaceae. Oak. English oak or pedunculate oak or French oak. Deciduous. Typically 40 m tall trees growing at elevations from 0 to 1000 m a.s.l. Dark bark. 800 years old. Fruit: acorn. Strong root system. *Q. robur* is the most frequent oak in central and western Europe, where it occurs from the south of Scandinavian Peninsula to the south of Italy. Trees are frequently present in coastal areas and less so in continental valleys. Oak forests usually encompass other forest species such as ash, maple, elm or lime. Oak trees require high sunlight (a south orientation) because they grow slowly. Their wood has traditionally been highly appreciated for vegetal coal and construction uses, among others. Noah's ark is said to have been constructed with oak wood. Whiskey casks are also made with it. Guernica's tree, an emblematic tree from the Basque Country, is *Q. robur*. The oak tree was called *robur* by the Romans for its hard wood. At present, oak stands are being converted into pasture for grazing or replaced with chestnut (*Castanea sativa*) stands. Oak forest areas are known to efficiently stand livestock including cows, horses and sheep.



Distribution of pedunculate oak in Occidental Europe (Source: Compiled by author using data from www.euforgen.org)

Quercus petraea. Fagaceae. Sessile oak. Deciduous. 35 m tall trees growing 300–1500 m a.s.l. *Q. petraea* is exclusive of western Europe. Its distribution usually overlaps with that of *Q. robur*. *Q. petraea* occurs on stony soils in the more continental valleys (far from the coast). This tree is very scant in the Iberian Peninsula, which is the boundary of its natural distribution. Bosque de Muniellos (Asturias) and Monte Ijedo (Cantabria and Burgos) stand some well-preserved areas of *Q. petraea*.

Quercus pyrenaica. Fagaceae. Pyrenean oak. Semi-deciduous (marcescent: deciduous trees that retain leaves throughout winter and complete the abscission layer in spring). Hairy leaves. 10–15 m tall (max 25 m) trees growing 400–1600 m a.s.l. *Q. pyrenaica* is a typically Iberian species distributed mainly in the Peninsula (from southern France to northern Africa). This is considered a transitional species between temperate forests and Mediterranean forests. This species requires at least 600 l/year precipitation (twice as much as Mediterranean forest species). Its name (pyrenaica) derives from a labelling error; in fact, this species is very scarce in the Pyrenees.

Hybrids: These species tend to form many hybrids. The most common is that between *Q. robur* and *Q. petraea*, which is called *Q. x rosacea*.

2.4.- Birch forest. *Betula pendula* and *B. pubescens* (*B. alba*). Silver birch and downy birch. Deciduous. 10–15 m tall. Smooth, silvered bark. These species are not frequent in the Iberian Peninsula. They tend to spread in the framework of other forests. When the original species (beech or oak) is cut down, birch trees easily occupy the resulting free space thank to their fast growth. In this transitional situation, real forests of birch are occasionally seen. In other situations, these species are able to grow at the boundaries between temperate and coniferous forests, in belts spanning a height difference of about 300 m.

2.5.- Mediterranean forest. Some Mediterranean forests spread into temperate forests. Such forests are deemed relictic forests at present. Some locations such as Valle de Somiedo (Asturias) and Valle de Liébana (Cantabria) have good representations of a Mediterranean forest within an Atlantic forest area.

2.6. Fauna (only vertebrates).

Iberian bear (*Ursus arctos*). 130 kg. Omnivorous. Winter dormancy. Critically endangered. Approximately 100 individuals in the Cantabrian range and Pyrenees. Re-introduced in the Pyrenees from Ukraine.

Wolf (*Canis lupus signatus*). The Iberian Peninsula hosts the largest population of wolves in western Europe (1500–2000 individuals). A direct competitor for humans. Carnivorous. First in the food chain (primary predator). In equilibrium with herbivores. Its extinction led to a loss of plant cover under the action of herbivores.

Roe deer (*Capreolus capreolus*). The smallest of cervidae (30 kg). Herbivorous. Back paws larger than front ones. Solitary and nocturnal. Deer populations have grown by effect of crop abandonment and forest exploitation. In equilibrium with the wolf (the only predator to adult deer).

Capercaillie (*Tetrao urogallus cantabricus*). An endemic subspecies of the Cantabrian mountain range.

2.7. Conclusions and threats. The original forest has been deforested for thousands of years. Many areas have been recovered by conservation programmes (protected sites, technical improvements). In many others, the use of fossil fuels has prevented deforestation to obtain vegetable coal. A new threat has arisen, however: ecotourism and its associated infrastructures (hotels, railways, motorways).

3. RIPARIAN FOREST.

3.1. Characteristics of the riparian environment. Riparian forests are forested areas adjacent to a water mass such as stream, river or lake. They are also called "gallery forests". A riparian forest is dependent on the water mass and hence independent of the environmental conditions (e.g., the river Nile has an abrupt ecotone). The presence of water modifies the local climate by (i) increasing water availability, (ii) raising relative humidity and (iii) leading to milder temperatures (especially highs). As a result, plants living in a riparian environment must frequently stand floods and the mechanical pressure of water. Owing to the permanence of water in the soil, plants require a high evapotranspiration rate to survive.

3.2. Permanent streams. With permanent streams, Euro-Siberian (deciduous) species tend to abound. Most plants —willows excepted— are trees 20–30 m tall and more than 100 years old. With a middle–lower reach, the ideal zonation, depending on the particular tolerance to flood, is as follows: willow (*Salix* sp., scrubs with flexible branches), alder (*Alnus* sp.), poplar (*Populus* sp.), ash (*Fraxinus* sp.) and elm (*Ulmus* sp.). The presence of these species is also dependent on temperature, altitude, concentration of cations (especially carbonates), degree of eutrophication and oxygenation of the water and soil texture, among other factors. Ferns (Pteridophyta) are frequent in the undergrowth and climbing plants in the canopy. The only species in the upper reach are willows. All species are deciduous as a result of this kind of forest originating in the Euro-Siberian region, where the deciduous trait is common (e.g., in temperate forests). The Mediterranean region has preserved the Euro-Siberian trait and riparian forests in the framework of Mediterranean evergreen forests are deciduous. The most common successional step after a riparian environment is degraded is blackberry (*Rubus* sp.).

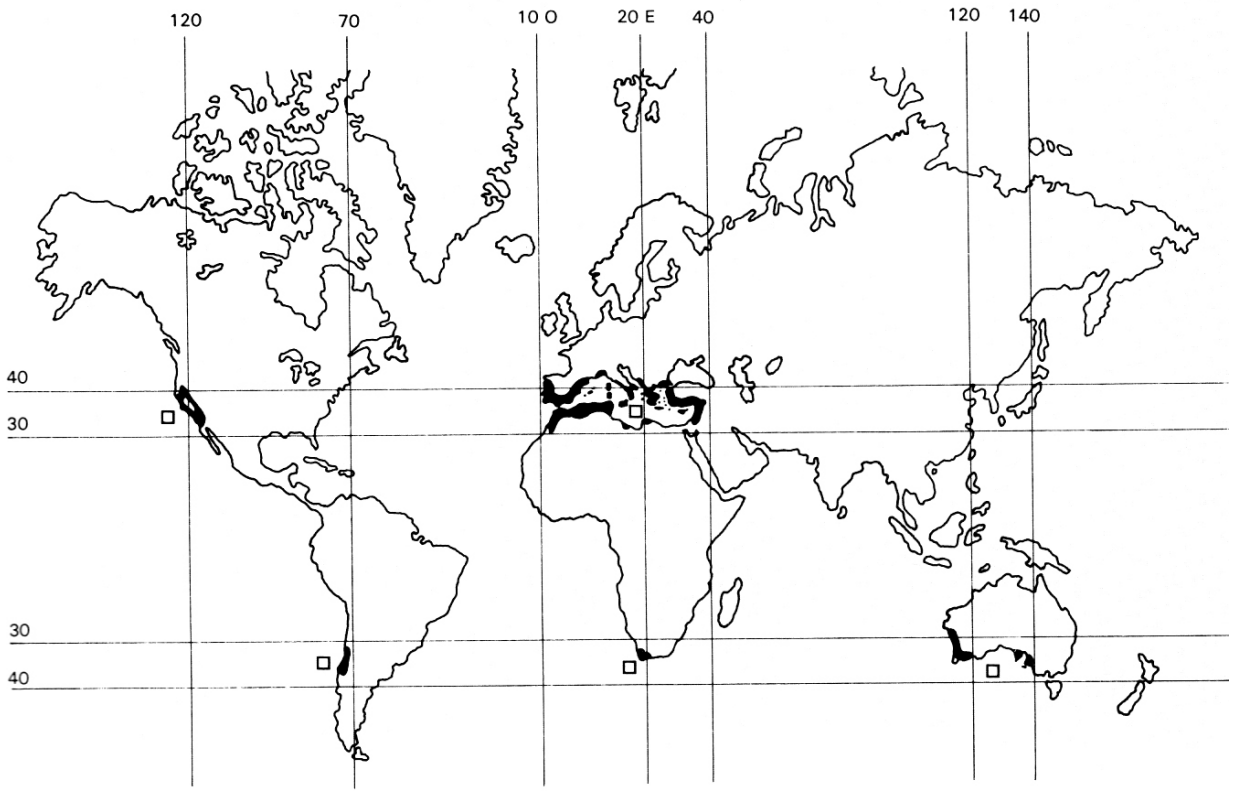
3.3. Temporal or ephemeral streams. With temporal streams, which are typical of rainy and drought periods during the year (e.g., under Mediterranean climate), the adjacent vegetation differs markedly. Thus, plants have to stand a period of flood and a period of drought. Only a few species can adapt to both: rosebay or oleander (*Nerium oleander*), blackberry (*Rubus ulmifolius*), tamujo (*Securinega tinctorea*) and tamarisk (*Tamarix* sp). Combinations of at least two of these species are frequent. Most species are scrubs or evergreens (*S. tinctorea* is deciduous and *Tamarix* is optionally deciduous). In many cases, reeds (Juncaceae and Cyperaceae) share the ecosystem with scrubs. Occasionally, the stream is **ephemeral**; thus, it exists only after several rainy days. Under these conditions, riparian vegetation is rare and incipient blackberry plants or some reeds may be found.

3.4. Conclusions and threats. These forests are seriously threatened. Their distribution areas are frequently converted into highly fertile cropland. Sewage and fertilizers reach streams and alter their biology and biochemistry. The end result is a couple of trees remaining as the sole testimony to this kind of forest. The disappearance of a riparian forest increases the risk of flood (especially in urban areas).

4. MEDITERRANEAN FOREST.

4.1. Mediterranean climate. This climate is characterized by a summer drought period that lasts several months. With few exceptions, winter temperatures are mild. This climate coexists in various areas of the Earth including California, Chile, the Capense region (Africa) and Australia. These areas have a similar ecosystem with evergreen tree species and thorny scrubs.

4.2. Distribution. The vegetation is known as “macchie”, “maquis” or “garigue” in the areas around the Mediterranean Sea; “chaparral” in southwestern North America; “Cape flora” in southern Africa and “mallee” in southwestern Australia. In the Iberian Peninsula, this type of vegetation occurs primarily in the Mediterranean region (particularly at the edge of the Mediterranean basin, where it occupies large expanses in the Iberian, Italic, Balkan and Anatolian peninsulae). This type of forest is also present in some areas of northern Africa (Morocco, Algeria and Tunisia, mainly). There are two main species: *Quercus ilex* (holm oak) and *Q. suber* (cork oak).



Global distribution of Mediterranean ecosystems (Source: reproduced from Borja Cardelus, 1990)

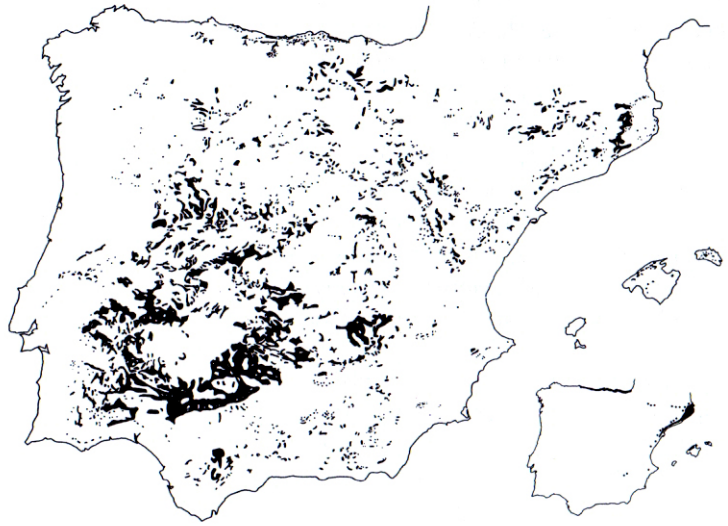
4.3. Ecophysiology of the Mediterranean forest. Plants in the Mediterranean ecosystem are well adapted to climatic stress in the form of cold —but wet— winters, and of drought periods due to irregular rainfall patterns and extremely dry and hot summers. Nutrients are frequently scant owing to a slow soil dynamics and the presence of stony, eroded soils. Adaptations involve development of thick leave cuticles (leathery leaves) and a hairy stoma on the underside of leaves (sclerophyllous leaves). In some cases, leaves become thorns. The main purpose of these changes is to avoid the loss of water through evapotranspiration. Trees often have sun and shade leaves in the same crown. The result is a low photosynthetic efficiency that is compensated for by a high solar irradiance (more than 3000 hours of sunlight each year in many areas of the Mediterranean basin). Tree species are evergreen and occasionally capable of withstanding temperatures as low as –25 ºC (–15 ºC for cork oaks) without damage. Leaf lifetime is approximately 2–4 years. Fruiting takes place in autumn (winter larder). Biomass production occurs after any rainfall event but concentrates in spring. Summer is the dormant season.

4.4. Structure and dynamics.

Holm oak forest. *Quercus ilex*. From creeper scrubs to 25 m tall plants depending on soil quality and predation by herbivores. Splitting dark brown bark. Fruit: acorn (October–November). From sea level to 1400 (2000) m a.s.l. Typical Mediterranean species of sclerophyllous forest. Associated to basic soils. Mature forests are accompanied by typical Mediterranean scrubs (e.g., Arbutus). Intensive overexploitation of forests has facilitated settling of serial scrub vegetation consisting mainly of Rockrose (*Cistus* sp.), furze (*Genista* sp) and gorse (*Ulex* sp.). Rockrose increases the incidence of forest fires (i.e, is pyrophytic). Some areas have major agroforestry systems: scrubs are removed but trees remain. Acorns are used to feed livestock in winter and so is pasture in spring. This agroforestry system, which is called *dehesa* in Spain, *montado* in Portu-

gal and *Pascolo arborato* in Italy, has been designated Biosphere Reserve by UNESCO's M&B Programme in the area of Sierra Morena mountains. Natural grassland in *dehesas* exhibits a high biodiversity.

Holm oak (*Q. ilex*) is a typical circum-Mediterranean tree species that is only absent from some semi-desertic or sub-desertic areas of the western Mediterranean region, where it is substituted by *Q. calliprinos* (a scrub similar to kermes oak, *Q. coccifera*). There are two subspecies: *Q. ilex* subsp. *ballota* (sweet acorn, rounded leaves, Iberian Peninsula and northwestern Africa) and *Q. ilex* subsp. *ilex* (bitter acorn, lengthened leaves, coastal Mediterranean areas).



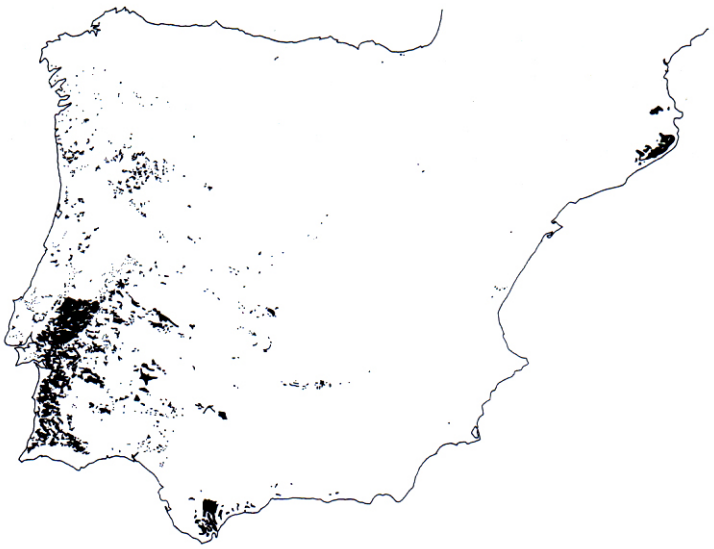
Distribution of Holm-Oak in the Iberian Peninsula (Source: reproduced from Costa-Tenorio et al., 1997)

Cork oak forest. *Quercus suber*. Trees 20–25 m tall with a thick bark (15 cm). Fruit: acorn (October–November). From sea level to 1200 (1500) m a.s.l. This species requires a mild climate (a mean temperature of ca. 15 ºC), a high relative humidity, 600–1000 l/year and low frost days. *Q. suber* is associated to acid soils (siliceous rocks). Mature cork oak forests are frequently very

dense and contain many climbing plants. Cork oaks span one million hectares in the Iberian Peninsula, with Portugal as the first cork producer in the world. The cork is used to manufacture bottle stoppers and insulating material. This forest type is widely present in the western Mediterranean region by effect of its Atlantic influence. In many areas, cork oak forests have been converted into *dehesas.*

Marcescent (semi-deciduous) oaks. Pyrenean oak (*Q. pyrenaica*) in the northwestern quadrant. Portuguese or Gal oak (*Q. faginea*) in the Iberian north-African area. Andalusian-oak (*Q. canariensis*) in Cadiz and northern Africa.

Mediterranean pines. Pines are widely spread in the Mediterranean basin. It is difficult to know which species have been introduced by man and which are native of this area. The main species are the Stone pine (*Pinus pinea*), especially in coastal areas of Huelva and Cadiz, the Maritime pine (*P. pinaster*), which is widely planted in the Iberian Peninsula, and the Aleppo pine (*P. halepensis*) in extremely dry areas —and also, planted, in many other areas of the Iberian Peninsula.



Cork oak distribution in the Iberian Peninsula. (Source: reproduced from Costa-Tenorio et al., 1997)

4.5. Fauna (only vertebrates).

The characteristic vertebrate species of Mediterranean forests is the **rabbit** (*Oryctolagus cuniculatus*). This is an endemic species in the south of the Iberian Peninsula and northwest of Africa. At present, it populates all continents. The rabbit, which feeds on daisies and grasses, is the main herbivorous link in the trophic chain.

The **Iberian lynx** (*Lynx pardina*) is the most endangered feline in the world, and an emblematic species in conservation and environmental education programmes. The Iberian lynx is smaller than the Palearctic lynx (*Lynx lynx*) and especially well adapted to the Mediterranean environment, where it lives in equilibrium with the rabbit in the trophic chain.

The **Iberian Imperial Eagle** (*Aquila adalberti*) is a threatened species discovered by R. Bhrem during an expedition sponsored by Prince Adalbert of Bavaria —hence its Latin name. At present, it occurs only in central and southwestern Spain, adjacent areas of Portugal and also, possibly, northern Morocco. This eagle feeds mainly on rabbits, but can prey on many other animals.

4.6 Conclusions. Mediterranean forests have been managed for centuries. However, many former areas (e.g., the Guadalquivir valley) have been completely deforested and used to grow intensive crops. In others, it is difficult to identify the original forests or trees have been replaced with other, fast-growing species such as pine or eucalyptus. Fortunately, current forests in the main areas are protected as Natural Protected Sites. Both forests and agroforestry systems (*dehesas*) have been designated Habitats of Community Importance (HCI) by the European Commission.

5. HIGH MOUNTAIN FOREST.

5.1. Introduction. As stated in the Introduction, the Iberian Peninsula abounds with mountain ranges. Some have been modelled into wide U-shape valleys by glaciers (especially in the Pyrenees). In the south, fluvial modelling was prevalent. Some ranges are at a high enough altitude to facilitate settlement of coniferous forests (commonly known as **taigas**). Taigas frequently occur in the upper (altitudinal) boundary of mountains forests. The prevailing species vary with the specific area and altitude. In general, the genus *Pinus* (pines) is the most frequent; however, some *Abies* (firs) are also usually present. All are nettle trees with nettle leaves (i.e., with a low surface/volume ratio).

5.2. Distribution. High mountain forests are present in both temperate and Mediterranean regions. In the latter, vegetation is more dependent on altitude than on climate. In general, mountain ranges more than 1500 m a.s.l. are able to stand coniferous forests. Such is the case with the Baetic System (both Subbaetic and Penibaetic), Central System, Iberian System and the Pyrenees. Summits above 3000 m a.s.l. are frequent in some ranges. The highest peak is Mulhacen (3478 m).

5.3. Characteristics of the high mountain environment. The presence of an **adiabatic gradient** (1 ºC/100 m altitude) makes the air cooler. Also, the presence of mountains has introduced asymmetry between **northern and southern slopes** —the latter are sunnier. A **Foehn effect** (Foehn wind) may occur depending on the particular global circulation model. The effect is especially apparent in the Baetic System.

5.4. Genetic isolation and glaciations. Mountains are like islands in the middle of an ocean. Fragmentation and isolation of populations is relatively frequent. Glaciations (periods of earth icing) pushed plants and animals southwards, thus leading to fragmented populations. With time, evolution has led to relict species. These processes, and climatic diversity, have resulted in a high biodiversity relative to plain areas (valleys).

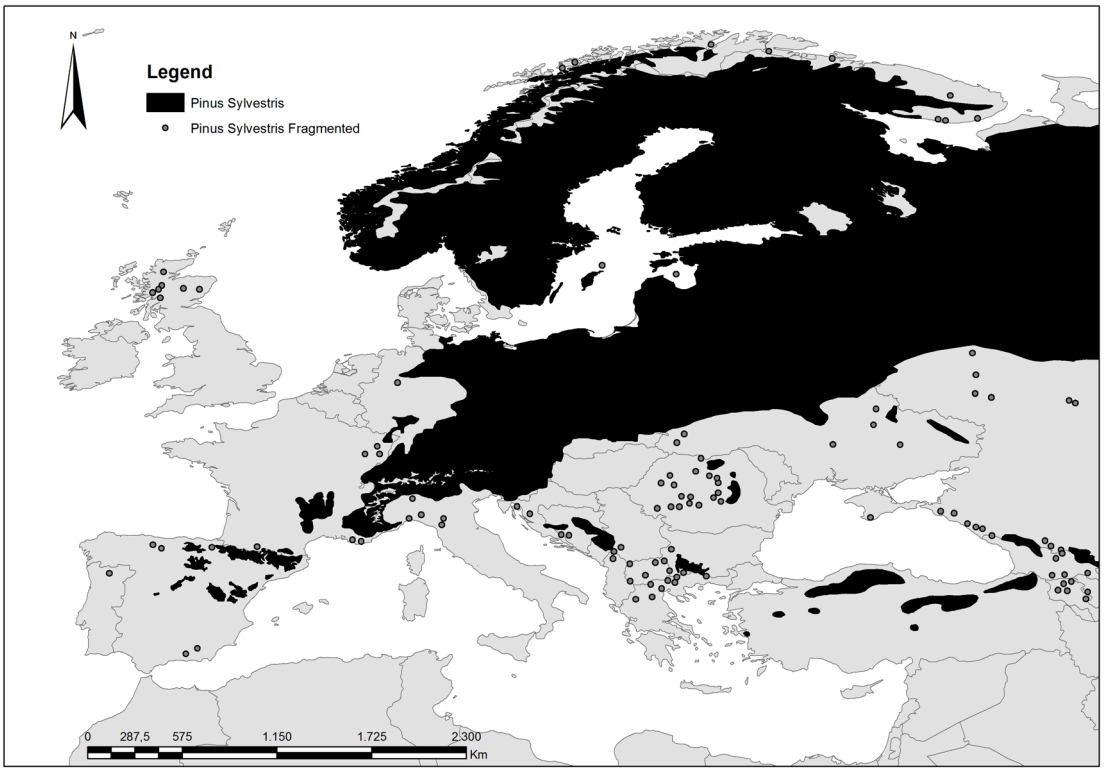
5.5. Structure and dynamics.

Latitudinal and altitudinal vegetation belts. From the equator to the polar ice cap, and from the basal belt to mountain summits, vegetation exhibits a similar pattern of bands (viz., rain forest, temperate forest, taiga and tundra).

Mountain pine (*Pinus uncinata*) **forest.** Trees up to 25 m tall. Creeper scrub at the upper limit. Conical–pyramidal shape. Asymmetric cones. Uncinated (hooked) scales. Slow growth and high longevity (500–600 years). Present from 1700–1900 to 2600–2700 m a.s.l. Western Alps and Pyrenees; some populations in the Central system. A characteristic tree of high mountains in the Euro-Siberian region of the Iberian Peninsula. Forests are open (not dense) and comprise arboreal, arbustive and herbaceous strata. Only a few creeper scrubs (e.g., Junipers, *Juniperus*) can survive at similar heights.

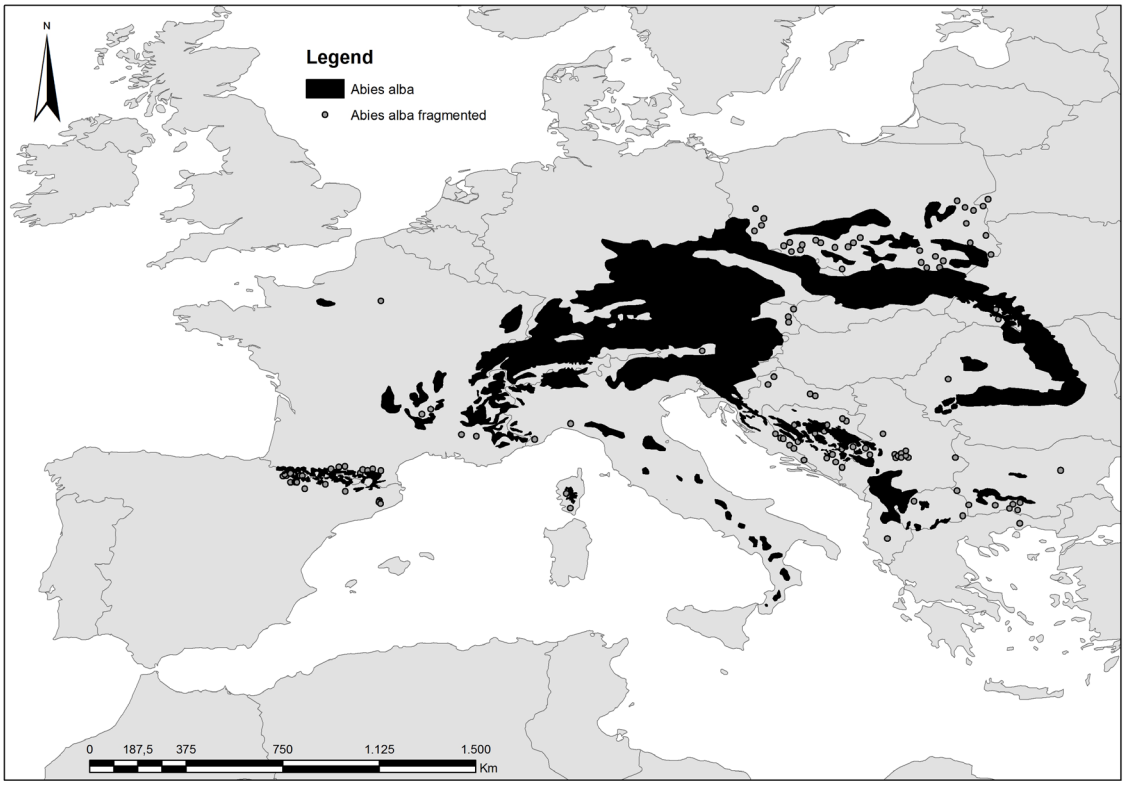
Scots pine (*Pinus sylvestris*) **forest.** Trees up to 30–40 m tall. Usually straight trunk but deformed in stony soils or under extreme conditions (wind and snow). Orange or salmon coloured bark. The most widely distributed pine in the world: from Scandinavia to Sierra Nevada and Iran,

and from Scotland to Manchuria. Such a wide distribution has led to a variety of races in the mountains of both Euro-Siberian and Mediterranean regions. In the Euro-Siberian region, Scots pines grow from 1000 to 1700 m a.s.l.; in the Mediterranean region, trees can grow at higher altitudes (1500–2100 m a.s.l.) and stand a long period of drought in summer. This species is frequent in Sierra Nevada mountains (*Pinus sylvestris* var. *nevadensis*).



Distribution of Scots pine in Occidental Europe (Source: Compiled by author using data from www.euforgen.org)

Silver fir (*Abies alba*) **forest.** Trees up to 30 (50) m tall. Conical–pyramidal shape. Light grey bark. Central and southern Europe. This species was addressed in the unit on temperate forests (fir–beech mixed forests). Silver firs are found in pure mass forests in higher areas (1200–2000 m a.s.l.) with decreased environmental humidity and poor soils. This species is only present in the Euro-Siberian region.



Distribution of Silver fir (Source: Compiled by author using data from www.euforgen.org)

Pinsapo fir (*Abies pinsapo*) **forest.** Trees up to 20 m tall. Conical–cylindrical shape. Brownish grey bark. This species belongs to the group of circum-Mediterranean firs (11 species distributed in the Mediterranean basin). The pinsapo fir is endemic and exclusive of the Penibaetic range. Its altitudinal range is 1000–1800 m a.s.l. Trees prefer northern and northwestern slopes, and an abundant precipitation regime (> 1000 mm). The pinsapo is a relict species with a high biogeographical interest. Because of its narrow distribution, it has been included on the red list of endangered species. Also, its forests have been included in Annex I of the Habitat Directive.

Black pine (*Pinus nigra*) **forest.** Trees up to 30–40 m tall. Variable shape. This species is exclusive of the Mediterranean region and encompasses several subspecies distributed along the basin. The subspecies present in the Iberian Peninsula is *P. nigra* subsp. *salzmanii*, which grows at altitudes from 800 to 1500 m a.s.l. —2000 in Cazorla. The black pine prefers basic soils and is substituted by the Maritime pine (*P. pinaster*) in siliceous (acid) soils, and by Scots pine (*P. sylvestris*) in its altitudinal range.

5.6. Fauna (only vertebrates):

Iberian ibex, Spanish ibex, mountain goat or Iberian wild goat (*Capra pyrenaica*). This species is especially well adapted to high mountain environments. Physical adaptation has allowed goats to run and leap on bare, rocky, rough and steep slopes. There have been four subspecies: *lusitanica* in Portugal (extinct in 1890); *pyrenaica* in the Pyrenees (extinct on January 6, 2000); *victoriae*, still living in Sierra de Gredos (Central System); and *hispanica*, widely distributed in the south (especially in the Baetic System).

Golden Eagle (*Aquila chrysaetos*). This species is especially frequent in the southern mountains (Andalusia), which possibly host the largest population in Europe (335 couples).

Bearded vulture (*Gypaetus barbatus*). A frequent vulture species in some mountains ranges of the Eurasian continent. Some couples (200 approx.) in the Cantabrian mountains and the Pyrenees. Re-introduced in the Alps and Baetic System. Locally endangered. Nesting up to 2000 m a.s.l.

Chamois (*Rupicabra rupicabra*). A mid-sized bovid native to the mountains in Europe.

Other species: marmot, newt (triton), stoat (ermine), white partridge.

5.7. Conclusions. Many high mountain forest areas are protected in the form of Natural Protected Sites (natural parks, national parks). A new threat is coming: ecotourism**.**

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Annex I. Iberian Forest Species.

Scientific name	Common noun (English)	Nombre común (español)	D/E[1]	N/E[2]	DISTRIBUTION
Abies alba	Silver fir	Abeto blanco	E	N	
Abies pinsapo	Pinsapo fir	Pinsapo	E	N	
Acer	Maple	Arce	D	N	
Alnus glutinosa	Black alder, European alder or common alder	Aliso	D	N	
Betula pendula	Silver birch	Abedul	D	N	
Castanea sativa	Chestnut	Castaño	D	E/C	
Eucaliptus	Eucalyptus	Eucalipto	E	E/C	
Fagus sylvatica	Beech	Haya	D	N	
Fraxinus angustifolia	Ash	Fresno del sur, Fresno de hoja estrecha	D	N	
Fraxinus excelsior	Ash	Fresno común	D	N	
Olea europaea	Olive tree	Acebuche. Olivo.	E	N/C	
Pinus halepensis	Aleppo pine (Aleppo, Syria)	Pino carrasco	E	N/C	
Pinus nigra	Black pine, Austrian pine	Pino laricio, pino salgareño	E	N/C	
Pinus pinaster	Maritime pine	Pino maritimo, pino negral	E	N/C	
Pinus pinea	Stone pine (fruit: pine nut)	Pino piñonero	E	N/C	
Pinus sylvestris	Scots pine	Pino albar, pino escocés	E	N/C	
Pinus uncinata	Mountain pine	Pino negro	E	N	
Populus alba	White poplar	Alamo blanco, chopo blanco	D	N	
Populus nigra	Black poplar	Alamo negro, chopo negro	D	N	
Quercus canariensis	Andalusian oak	Quejigo andaluz, quejigo africano	D	N	
Quercus faginea	Gall oak. Portuguese oak	Quejigo	D	N	
Quercus ilex	Holm oak	Encina, alsina,	E	N	
Quercus petraea	Sessile oak	Roble albar	D	N	
Quercus pyrenaica	Pyrenean oak	Melojo, roble melojo, rebollo	D	N	
Quercus robur	Oak. English oak or pedunculate oak or French oak.	Roble. Roble Carballo. Carvallo. Roble pedunculado	D	N	
Quercus suber	Cork oak	Alcornoque	E	N	
Salix	Willow	Sauce	D	N	
Tilia cordata	Lime	Tilo	D	N	
Tilia platyphyllos	Lime	Tilo	D	N	
Ulmus minor	Elm	Olmo	D	N	

1. Deciduous (D) / Evergreen (E). 2. Natural (N) / Exotic or introduced (E) / Cultivated (C).